



Core Testing>Basic Testing>Day 1

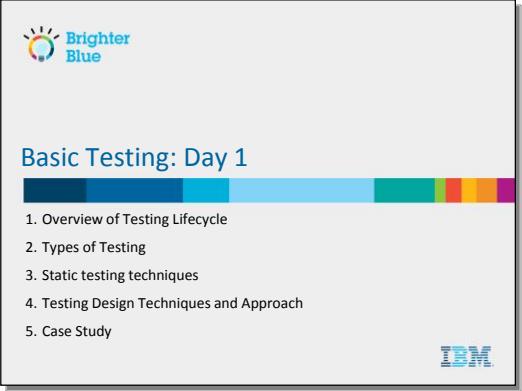
Student Guide

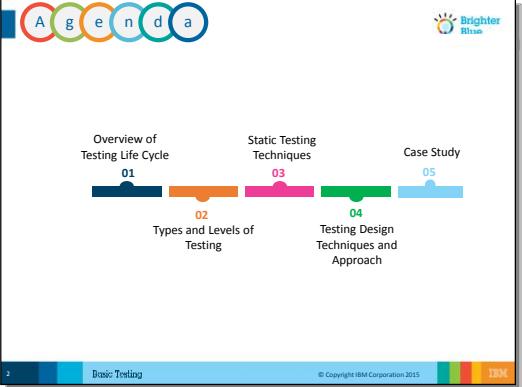


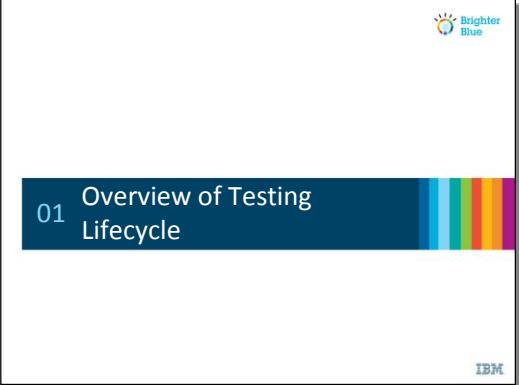
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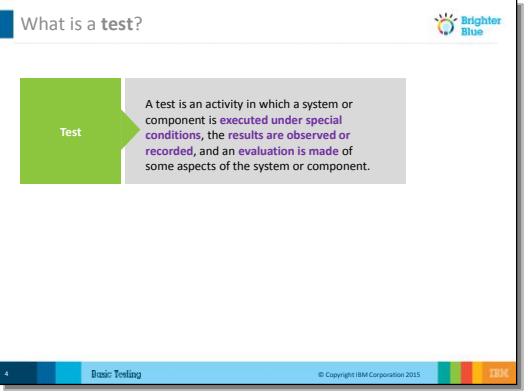
Module 01: Overview of Testing Life Cycle

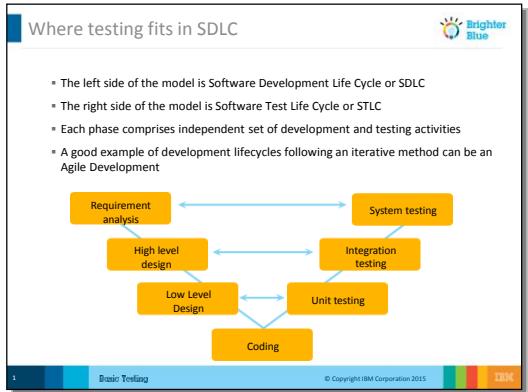
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| <p>Slide 1</p>  <p>Basic Testing: Day 1</p> <ul style="list-style-type: none">1. Overview of Testing Lifecycle2. Types of Testing3. Static testing techniques4. Testing Design Techniques and Approach5. Case Study <p>IBM</p> | |

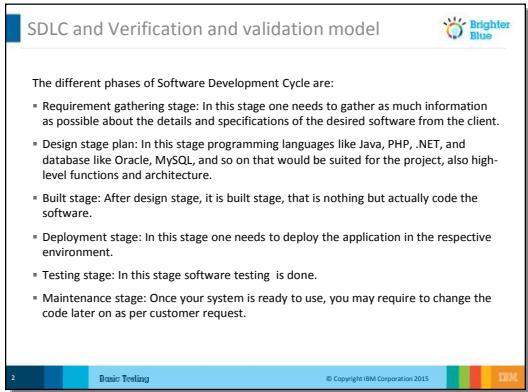
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| <p>Slide 2</p>  <p>The slide features a decorative header with the word "Agenda" in a colorful, bubbly font. Below the title, there is a horizontal timeline consisting of five colored bars (blue, orange, pink, green, blue) numbered 01 through 05. Each bar is associated with a topic: 01 Overview of Testing Life Cycle, 02 Types and Levels of Testing, 03 Static Testing Techniques, 04 Testing Design Techniques and Approach, and 05 Case Study. The slide also includes the Brighter Blue logo in the top right corner and the IBM logo at the bottom right.</p> | |

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| <p>Slide 3</p>  <p>At the end of this module, you should be able to:</p> <ul style="list-style-type: none">• Give an overview of testing lifecycle• Describe the various test strategies• Describe the varied facets of test planning• Recall the process of Test Case creation• Recall the process of test execution• List the testing types• Describe default workflow | |

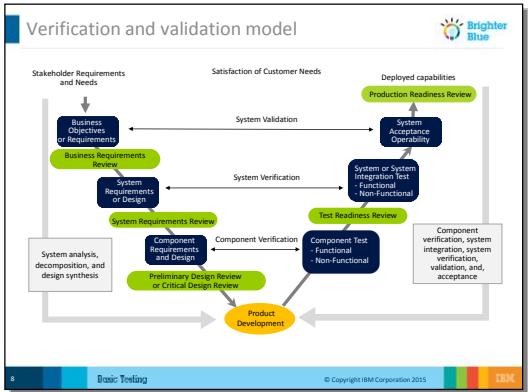
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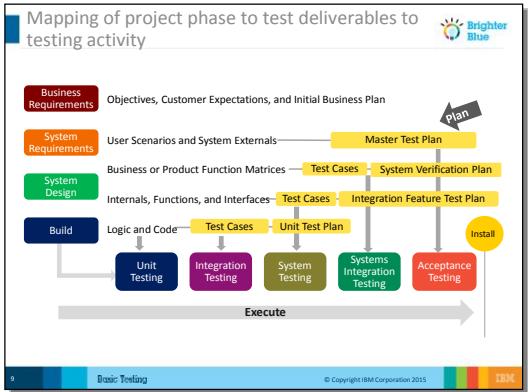
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| <p>Slide 4</p>  <p>The slide title is "What is a test?". A green box on the left contains the word "Test". To its right is a grey box containing the definition: "A test is an activity in which a system or component is executed under special conditions, the results are observed or recorded, and an evaluation is made of some aspects of the system or component." The slide footer includes the number "4", the title "Basic Testing", the copyright notice "© Copyright IBM Corporation 2015", and the IBM logo.</p> | |

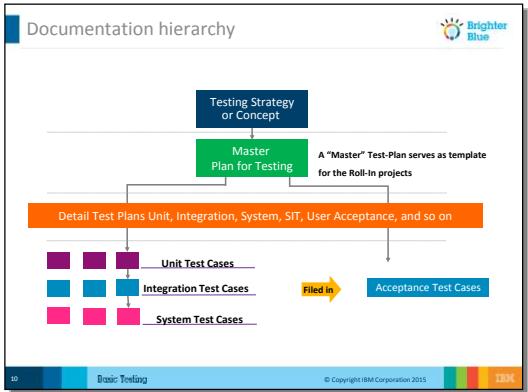
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| <p>Slide 5</p> <div data-bbox="454 432 982 824"><p>Where testing fits in SDLC</p><p>The diagram illustrates the relationship between the Software Development Life Cycle (SDLC) and the Software Test Life Cycle (STLC). It shows two parallel vertical columns of phases, each with bidirectional arrows indicating their interaction.</p><p>SDLC Phases:</p><ul style="list-style-type: none">Requirement analysisHigh level designLow Level DesignCoding<p>STLC Phases:</p><ul style="list-style-type: none">System testingIntegration testingUnit testing<p>Arrows indicate the flow from Requirement analysis to High level design, High level design to Low Level Design, Low Level Design to Coding, and Coding back to Requirement analysis. Similarly, there are bidirectional arrows between System testing and Integration testing, and between Integration testing and Unit testing.</p></div> | |

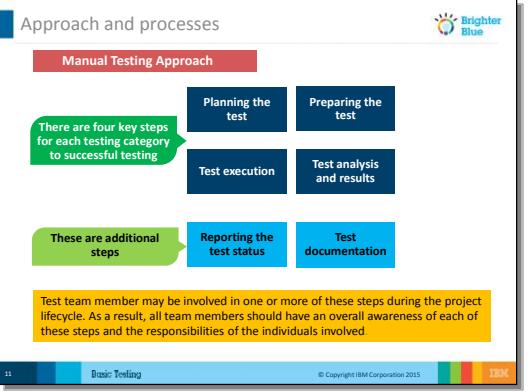
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| <p>Slide 6</p> <div data-bbox="451 432 979 824"><p>SDLC and Verification and validation model</p><p>The different phases of Software Development Cycle are:</p><ul style="list-style-type: none">▪ Requirement gathering stage: In this stage one needs to gather as much information as possible about the details and specifications of the desired software from the client.▪ Design stage plan: In this stage programming languages like Java, PHP, .NET, and database like Oracle, MySQL, and so on that would be suited for the project, also high-level functions and architecture.▪ Built stage: After design stage, it is built stage, that is nothing but actually code the software.▪ Deployment stage: In this stage one needs to deploy the application in the respective environment.▪ Testing stage: In this stage software testing is done.▪ Maintenance stage: Once your system is ready to use, you may require to change the code later on as per customer request.<p>Business Testing © Copyright IBM Corporation 2015 IBM</p></div> | |

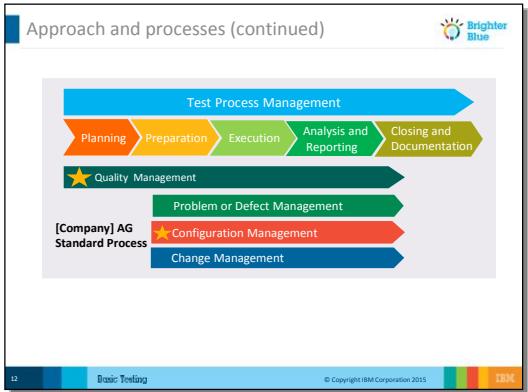
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| <p>Slide 7</p> <div data-bbox="454 432 971 816"><p>SDLC and Verification and validation model (continued)</p><ul style="list-style-type: none">▪ Deployment stage: In this stage one needs to deploy the application in the respective environment.▪ Testing stage: In this stage software testing is done.▪ Maintenance stage: Once your system is ready to use, you may require to change the code later on as per customer request.<p>Conclusion</p><ul style="list-style-type: none">▪ Testing is not a stand-alone activity, and it has to adapt the development model chosen for the project.▪ In any model, testing should be performed at all levels i.e. right from requirements until maintenance.<p>3 Basic Testing © Copyright IBM Corporation 2015 </p></div> | |

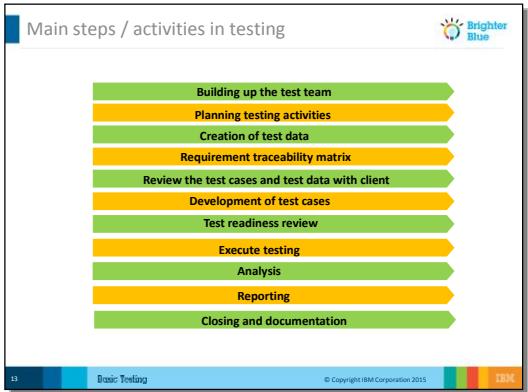
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| <p>Slide 8</p>  <pre> graph TD A[Stakeholder Requirements and Needs] --> B[Business Objectives or Requirements] B --> C[Business Requirements Review] C --> D[System Requirements or Design] D --> E[System Requirements Review] E --> F[Component Requirements and Design] F --> G[Preliminary Design Review or Critical Design Review] G --> H[Product Development] H --> I[Component Test - Functional & Non-Functional] I --> J[Component Requirements Review] J --> K[System or System Integration Test - Functional & Non-Functional] K --> L[Test Requirements Review] L --> M[System Operability] M --> N[Production Readiness Review] N --> O[Deployed capabilities] O -- Satisfaction of Customer Needs --> P[Business Objectives or Requirements] P --> Q[Business Requirements Review] Q --> R[System Requirements or Design] R --> S[System Requirements Review] S --> T[Component Requirements and Design] T --> U[Preliminary Design Review or Critical Design Review] U --> V[Product Development] V --> W[Component Test - Functional & Non-Functional] W --> X[Component Requirements Review] X --> Y[System or System Integration Test - Functional & Non-Functional] Y --> Z[Test Requirements Review] Z --> AA[System Operability] AA --> BB[Production Readiness Review] BB --> CC[Deployed capabilities] </pre> <p>The diagram illustrates the Verification and validation model. It shows a cyclical process starting with Stakeholder Requirements and Needs, leading through Business Objectives, Business Requirements Review, System Requirements, System Requirements Review, Component Requirements, Preliminary Design Review, Product Development, Component Test (Functional & Non-Functional), Component Requirements Review, System or System Integration Test (Functional & Non-Functional), Test Requirements Review, System Operability, Production Readiness Review, and finally Deployed capabilities. Arrows indicate the flow from one stage to the next, with feedback loops returning to earlier stages. The process is divided into four main phases: Business Requirements Review, System Requirements Review, Component Requirements Review, and Test Requirements Review.</p> | |

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| <p>Slide 9</p>  <p>The diagram illustrates the mapping of project phases to test deliverables and activities. It shows a flow from initial requirements and design through build, test planning, execution, and finally installation.</p> <ul style="list-style-type: none"> Plan: Business Requirements (Objectives, Customer Expectations, and Initial Business Plan) lead to System Requirements (User Scenarios and System Externals), which lead to System Design (Business or Product Function Matrices). These are mapped to Test Cases and System Verification Plan. Build: System Design leads to Logic and Code, which is mapped to Test Cases and Unit Test Plan. Test: Test Cases from various stages lead to different types of testing: Unit Testing, Integration Testing, System Testing, Systems Integration Testing, and Acceptance Testing. Execute: All testing activities converge on a single Execute phase, which leads to the final step, Install. | |

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| <p>Slide 10</p>  <p>The diagram illustrates a Documentation hierarchy:</p> <ul style="list-style-type: none">Testing Strategy or Concept (dark blue box)An arrow points down to the Master Plan for Testing (green box).A callout box states: "A 'Master' Test-Plan serves as template for the Roll-In projects".The Master Plan for Testing branches into Detail Test Plans (orange box), which further branch into:<ul style="list-style-type: none">Unit Test Cases (purple boxes)Integration Test Cases (blue boxes)System Test Cases (pink boxes)An arrow labeled "Filed in" points from the Integration Test Cases to the Acceptance Test Cases (blue box). <p>IBM Basic Testing</p> | |

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| <p>Slide 11</p>  <p>The slide content displays a diagram titled "Approach and processes" under the heading "Manual Testing Approach". It shows a flowchart with four main steps: "Planning the test", "Preparing the test", "Test execution", and "Test analysis and results". A callout box highlights "There are four key steps for each testing category to successful testing". Below the main steps, a green box indicates "These are additional steps" leading to "Reporting the test status" and "Test documentation". A note at the bottom states: "Test team member may be involved in one or more of these steps during the project lifecycle. As a result, all team members should have an overall awareness of each of these steps and the responsibilities of the individuals involved". The slide footer includes the number "11", the title "Basic Testing", and the copyright notice "© Copyright IBM Corporation 2015".</p> | |

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| <p>Slide 12</p>  <p>The diagram illustrates the Test Process Management flow, which consists of five sequential phases: Planning, Preparation, Execution, Analysis and Reporting, and Closing and Documentation. Below this main flow, there are several supporting management processes: Quality Management, Problem or Defect Management, Configuration Management, and Change Management. The entire process is labeled as a [Company] AG Standard Process.</p> | |

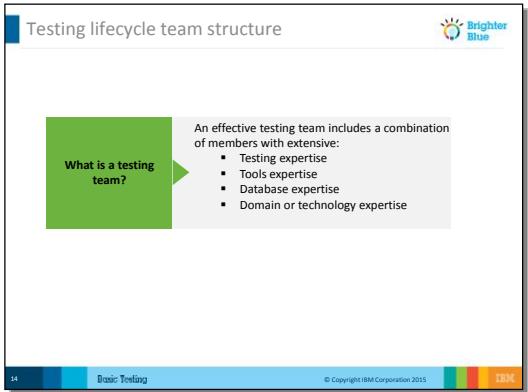
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| <p>Slide 13</p>  <p>Building up the test team:</p> <ul style="list-style-type: none"> • Recruit and Onboard team members • Assign team members to roles (Business and IT) • Coach testing team members (Key User on Application) <p>Planning testing activities:</p> <ul style="list-style-type: none"> • Analyze business requirements • Estimate test effort | |

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| <ul style="list-style-type: none"> • Create Project Plan • Prepare test plan or test strategy document for various types of testing • Select test tool • Plan resource and determine roles and responsibilities <p>Creation of test data:</p> <ul style="list-style-type: none"> • Align with business user and business analyst to define demand for test data • Create test data <p>Requirement traceability matrix:</p> <ul style="list-style-type: none"> • Prepare the requirement traceability verification matrix or RTVM by mapping each requirement with test cases <p>Review the test cases and test data with client:</p> <ul style="list-style-type: none"> • Send the initial version of test cases for review • Close all the review comments by updating the test cases • Get signed off test cases and test data | |

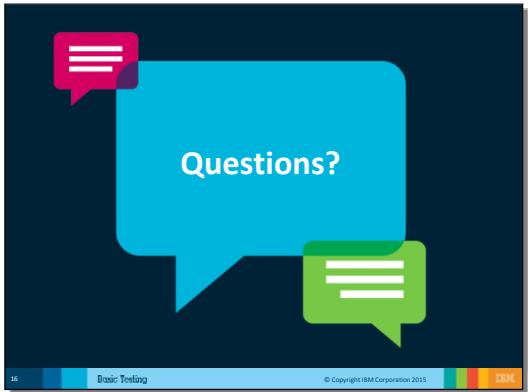
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| <ul style="list-style-type: none">• Archive approved test cases and test data <p>Development of test cases:</p> <ul style="list-style-type: none">• Identify test cases• Evaluate test cases regarding risk categories• Define test entry and exit criteria• Describe test cases• Peer review of test cases <p>Test Readiness Review</p> <ul style="list-style-type: none">• Verify test environment is setup and stable for execution• Verify unit test results pass the entry criteria of testing phase• Client-approved test cases and test data• Perform Smoke test <p>Execute Testing</p> <ul style="list-style-type: none">• Execute tests as per plan | |

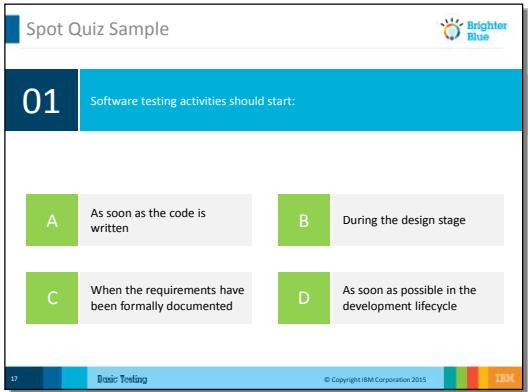
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| <ul style="list-style-type: none">• Document test results, and log defects for failed cases• Update test plans or test cases, if necessary• Retest the defect fixes and tack the defects to closure• Do regression testing of application <p>Analysis</p> <ul style="list-style-type: none">• Analyze the Test results• Prepare Test Metrics:Time, Test coverage, Cost, Software Quality, and Critical Business Objectives• Perform Causal analysis– prepare Causal Analysis Report <p>Reporting</p> <ul style="list-style-type: none">• Publish Test Metrics• Publish Test reports: Test Summary report, Causal Analysis Report, and Audit Report <p>Closing and Documentation</p> <ul style="list-style-type: none">• Analyze the Test results | |

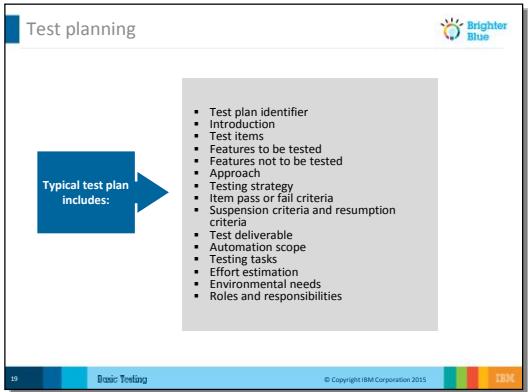
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| <ul style="list-style-type: none">• Prepare Test Metrics- Time, Test coverage, Cost, Software Quality, and Critical Business Objectives• Perform Causal analysis– Prepare Causal Analysis Report | |

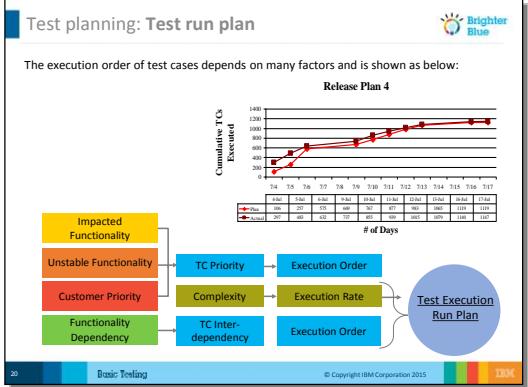
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| <p>Slide 14</p>  <p>The slide title is "Testing lifecycle team structure". A green callout box on the left contains the question "What is a testing team?". To the right of the callout, the text states: "An effective testing team includes a combination of members with extensive:" followed by a bulleted list: "Testing expertise", "Tools expertise", "Database expertise", and "Domain or technology expertise". The slide footer includes the number "14", the title "Basic Testing", and the copyright notice "© Copyright IBM Corporation 2015".</p> | |

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| <p>Slide 15</p>  <p>The slide features a yellow background with a central illustration of a smartphone and gears. At the top, the word "Activity" is written in a blue, bubbly font, with each letter inside a small blue circle. In the top right corner is the Brighter Blue logo. Below the title, a text box contains the instruction: "Remember and recite the testing lifecycle term definitions given in the lists provided below:". Below this text are four document icons, each labeled "Testing Lifecycle Term Definitions" followed by a letter: A, B, C, and D. The bottom of the slide has a blue footer bar with the text "Basic Testing" and the IBM logo.</p> <p>Refer to the Supporting Documents_Day 1 folder for the embedded files.</p> | |

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| <p>Slide 16</p>  <p>The slide features a dark blue background. In the center is a large light blue speech bubble containing the text "Questions?". To its left is a small pink speech bubble with horizontal lines, and to its right is a small green speech bubble with horizontal lines. At the bottom of the slide, there is a thin blue footer bar with the text "Basic Testing" and "© Copyright IBM Corporation 2015" along with the IBM logo.</p> | |

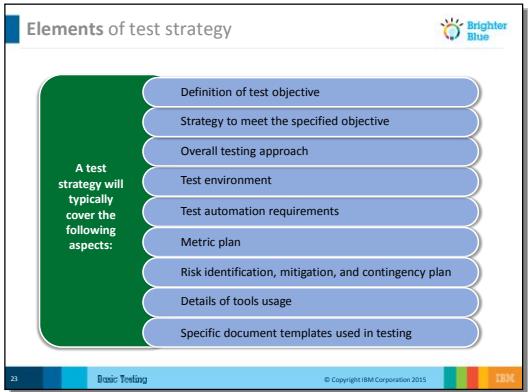
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| <p>Slide 17</p>  <p>The slide is titled "Spot Quiz Sample" and features a question numbered 01. The question asks: "Software testing activities should start:". Below the question are four options labeled A, B, C, and D, each in a green box:</p> <ul style="list-style-type: none">A: As soon as the code is writtenB: During the design stageC: When the requirements have been formally documentedD: As soon as possible in the development lifecycle <p>At the bottom of the slide, there is a navigation bar with icons for back, forward, and search, and the text "Basic Testing" and "© Copyright IBM Corporation 2015".</p> | |

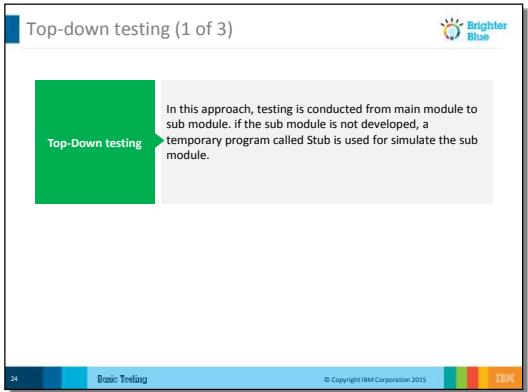
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| <p>Slide 18</p>  <p>The slide is titled "Test planning" and features a blue arrow pointing right containing the text "Typical test plan includes:". To the right of the arrow is a list of items:</p> <ul style="list-style-type: none">▪ Test plan identifier▪ Introduction▪ Test items▪ Features to be tested▪ Features not to be tested▪ Approach▪ Testing strategy▪ Item pass or fail criteria▪ Suspension criteria and resumption criteria▪ Test deliverable▪ Actual test scope▪ Testing tasks▪ Effort estimation▪ Environmental needs▪ Roles and responsibilities <p>At the bottom of the slide, there is a navigation bar with icons for back, forward, and search, and the text "Basic Testing" and "© Copyright IBM Corporation 2015".</p> | |

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| <p>Slide 19</p>  <p>The execution order of test cases depends on many factors and is shown as below:</p> <p>Release Plan 4</p> <p>Cumulative TCs Executed</p> <p># of Days</p> <p>Test Execution Run Plan</p> <p>Factors Influencing Execution Order:</p> <ul style="list-style-type: none"> Impacted Functionality Unstable Functionality Customer Priority Functionality Dependency <p>Flowchart Summary:</p> <pre> graph LR A[Impacted Functionality] --> B[TC Priority] B --> C[Execution Order] D[Unstable Functionality] --> B E[Customer Priority] --> F[TC Inter-dependency] F --> G[Execution Order] G --> H[Complexity] H --> I[Execution Rate] I --> C J[Functionality Dependency] --> F C --> K[Test Execution Run Plan] I --> K </pre> <p>© Copyright IBM Corporation 2015</p> | |

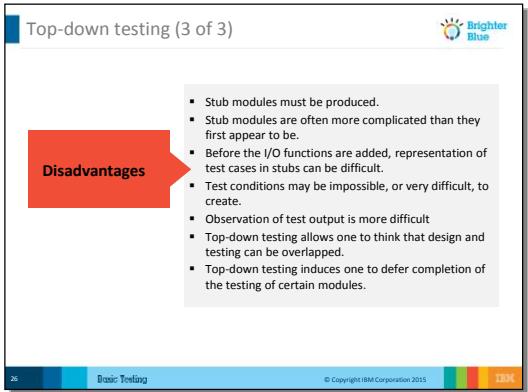
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| <p>Slide 20</p> <div data-bbox="454 432 971 824"><p>Test planning: Test run plan (continued)</p><ul style="list-style-type: none">▪ Pre conditions :-▪ Requirements baselines▪ Project Plan finalized▪ Test items▪ Features to be tested▪ Features.<p>4 Basic Testing © Copyright IBM Corporation 2015 </p></div> | |

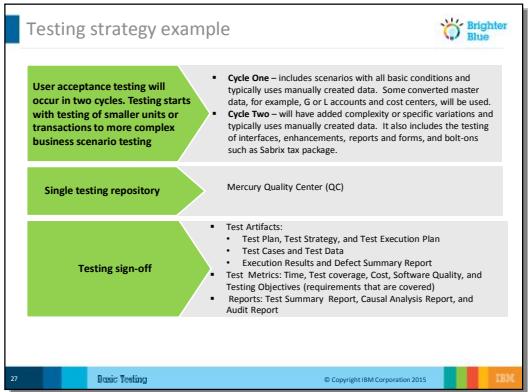
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| <p>Slide 21</p> <div data-bbox="451 432 979 824"><p>Test strategy</p><p>It is a statement of overall approach of testing to meet the business and test objectives.</p><p>It is a plan level document and has to be prepared in the requirement stage of the project.</p><p>It identifies the methods, techniques, and tools to be used for testing.</p><p>It can be a project specific or an organization specific.</p><p>It is critical to the success of the software development to develop a test strategy, which effectively meets the needs of the organization or project.</p><p>It must be effective enough to meet the project and business objectives.</p><p>It should define the strategy upfront before the actual testing helps in planning the test activities.</p><p>22 Basic Testing © Copyright IBM Corporation 2015 IBM</p></div> | |

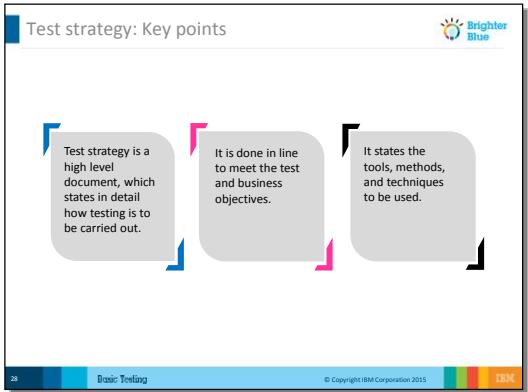
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| <p>Slide 22</p>  <p>The slide title is "Elements of test strategy". A green callout box on the left lists "A test strategy will typically cover the following aspects:" followed by a bulleted list of eight items. The main list items are: Definition of test objective, Strategy to meet the specified objective, Overall testing approach, Test environment, Test automation requirements, Metric plan, Risk identification, mitigation, and contingency plan, Details of tools usage, and Specific document templates used in testing.</p> <p>23 Basic Testing © Copyright IBM Corporation 2015 IBM</p> | |

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| <p>Slide 23</p> <div data-bbox="454 432 982 824"><p>Top-down testing (1 of 3)</p><p>Top-Down testing</p><p>In this approach, testing is conducted from main module to sub module. If the sub module is not developed, a temporary program called Stub is used to simulate the sub module.</p><p>24 Basic Testing © Copyright IBM Corporation 2015 IBM</p></div> | |

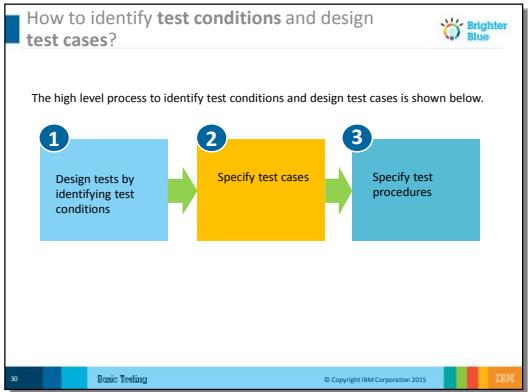
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| <p>Slide 24</p> <div data-bbox="451 432 982 824"><p>Top-down testing (2 of 3)</p><p>Advantages</p><ul style="list-style-type: none">▪ Top-down testing is advantageous if major flaws occur toward the top of the program.▪ Once the I/O functions are added, representation of test cases is easier.▪ Early skeletal Program allows demonstrations and boosts morale.<p>25 Basic Testing © Copyright IBM Corporation 2015 </p></div> | |

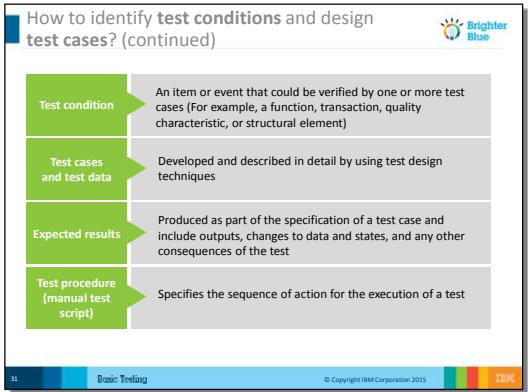
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| <p>Slide 25</p>  <p>The screenshot shows a presentation slide with the title "Top-down testing (3 of 3)" at the top left. At the top right is the Brighter Blue logo. A red arrow points from the text "Disadvantages" to a list of nine bullet points describing the disadvantages of top-down testing:</p> <ul style="list-style-type: none">▪ Stub modules must be produced.▪ Stub modules are often more complicated than they first appear to be.▪ Before the I/O functions are added, representation of test cases in stubs can be difficult.▪ Test conditions may be impossible, or very difficult, to create.▪ Observation of test output is more difficult▪ Top-down testing allows one to think that design and testing can be overlapped.▪ Top-down testing induces one to defer completion of the testing of certain modules. <p>At the bottom of the slide, there is a navigation bar with icons for back, forward, and search, and the text "Basic Testing". The footer contains the IBM logo and the copyright notice "© Copyright IBM Corporation 2015".</p> <p>Example: Suppose Sales Order Printing program uses another unit which calculates Sales discounts by some complex calculations. Then call to this unit will be replaced by a Stub, which will simply return fix discount data.</p> | |

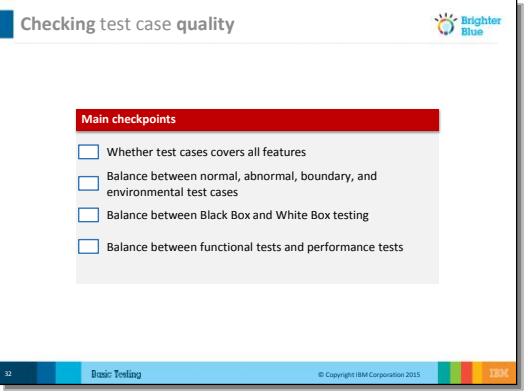
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| <p>Slide 26</p>  <pre> graph TD A["User acceptance testing will occur in two cycles. Testing starts with testing of smaller units or transactions to more complex business scenario testing"] --> B["Single testing repository"] B --> C["Testing sign-off"] </pre> <p>The diagram illustrates a testing strategy example. It shows a flow from 'User acceptance testing will occur in two cycles. Testing starts with testing of smaller units or transactions to more complex business scenario testing' through a 'Single testing repository' to 'Testing sign-off'. The 'Single testing repository' is associated with 'Mercury Quality Center (QC)'. The 'Testing sign-off' stage includes a list of test artifacts: Test Plan, Test Strategy, and Test Execution Plan; Test Cases and Test Data; Execution Results and Defect Summary Report; Test Metrics: Time, Test coverage, Cost, Software Quality, and Testing Objectives (requirements that are covered); and Reports: Test Summary Report, Causal Analysis Report, and Audit Report.</p> | |

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| <p>Slide 27</p> <div data-bbox="454 432 982 824"><p>Test strategy: Key points</p><p>The slide content is a presentation slide titled "Test strategy: Key points". It features three callout boxes with blue, pink, and black outlines, each containing a key point about test strategy. The first box states: "Test strategy is a high level document, which states in detail how testing is to be carried out." The second box states: "It is done in line to meet the test and business objectives." The third box states: "It states the tools, methods, and techniques to be used." The slide includes a navigation bar at the bottom with icons for back, forward, and search, and the text "Basic Testing" and "© Copyright IBM Corporation 2015".</p></div> | |

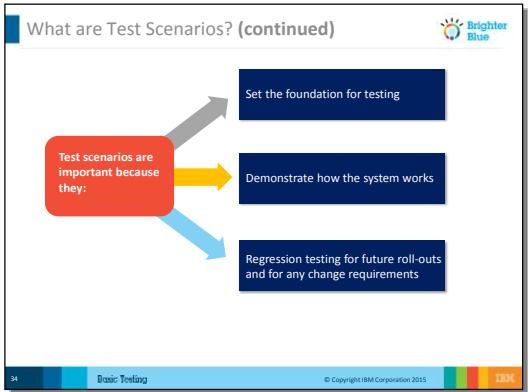
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| <p>Slide 28</p> <div data-bbox="451 432 979 824"><p>Test case design: key aspects</p><p>We will take a look at the following key aspects of test case design in the following slides.</p><ul style="list-style-type: none">1 How to identify test conditions and design test cases?2 what are the different categories of test design techniques?<p>29 Basic Testing © Copyright IBM Corporation 2015 IBM</p></div> | |

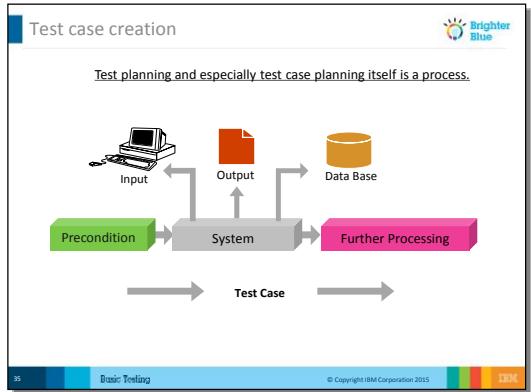
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| <p>Slide 29</p>  <p>The high level process to identify test conditions and design test cases is shown below.</p> <ol style="list-style-type: none">1 Design tests by identifying test conditions2 Specify test cases3 Specify test procedures <p>30 Basic Testing © Copyright IBM Corporation 2015 IBM</p> | |

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| <p>Slide 30</p>  <p>The slide contains the following definitions:</p> <ul style="list-style-type: none">Test condition: An item or event that could be verified by one or more test cases (For example, a function, transaction, quality characteristic, or structural element)Test cases and test data: Developed and described in detail by using test design techniquesExpected results: Produced as part of the specification of a test case and include outputs, changes to data and states, and any other consequences of the testTest procedure (manual test script): Specifies the sequence of action for the execution of a test <p>31 Basic Testing © Copyright IBM Corporation 2015 IBM</p> | |

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| <p>Slide 31</p>  <p>The slide title is "Checking test case quality". It features a "Main checkpoints" section with the following list:</p> <ul style="list-style-type: none"><input type="checkbox"/> Whether test cases covers all features<input type="checkbox"/> Balance between normal, abnormal, boundary, and environmental test cases<input type="checkbox"/> Balance between Black Box and White Box testing<input type="checkbox"/> Balance between functional tests and performance tests <p>At the bottom, there is a navigation bar with icons for back, forward, and search, along with the text "Basic Testing" and "© Copyright IBM Corporation 2015".</p> | |

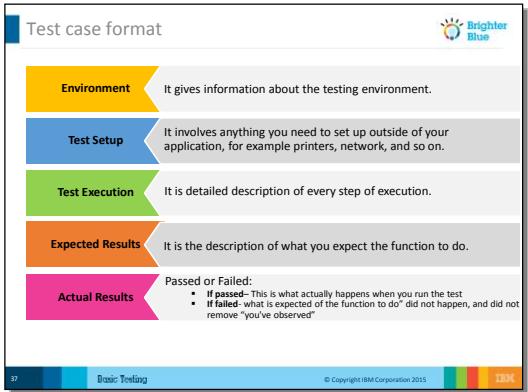
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| <p>Slide 32</p> <div data-bbox="451 432 979 824"><p>What are Test Scenarios?</p><ul style="list-style-type: none">Test scenarios are the processes to test, such as process a manual non-PO invoice against a cost center:<ul style="list-style-type: none">The testing team and expert users brainstormed test scenarios to test and documented them in a test matrix. Key points considered:Master data requirements such as vendors, cost centers, and so onConverted data that may be required, for example, assets, cost centers, G or L accounts, and so onComplexity of the test scenario to determine in which cycle the test should be executedDetermining which interfaces, enhancements, reports, or forms are incorporated into each scenarioWhether a variation changes a step or the entire process that may require a new scenario<p>33 Basic Testing © Copyright IBM Corporation 2015 </p></div> | |

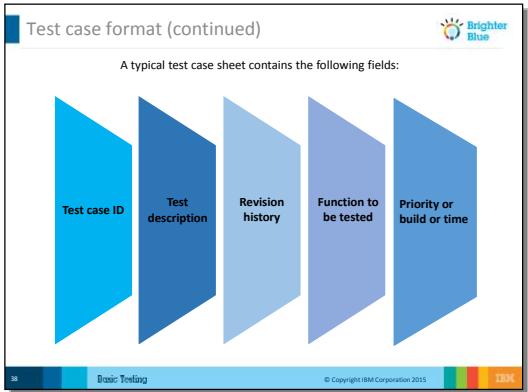
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| <p>Slide 33</p>  <p>The slide title is "What are Test Scenarios? (continued)". It features a red callout box containing the text "Test scenarios are important because they:" followed by three blue rectangular boxes: "Set the foundation for testing", "Demonstrate how the system works", and "Regression testing for future roll-outs and for any change requirements". The slide footer includes the number "34", the text "Basic Testing", and the IBM logo.</p> | |

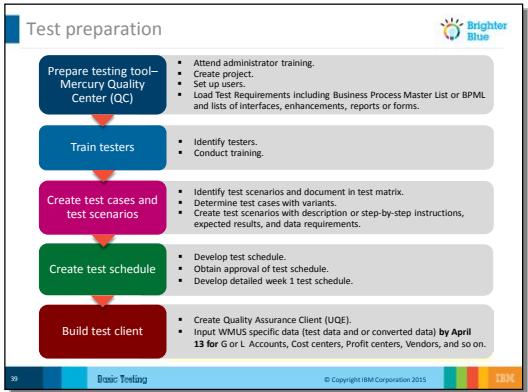
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| <p>Slide 34</p> <div data-bbox="451 432 982 824"><p>Test case creation</p><p>Test planning and especially test case planning itself is a process.</p><pre>graph LR; Precondition[Precondition] --> System[System]; System -- Input --> ComputerIcon[Computer]; System -- Output --> FolderIcon[Folder]; System --> DataBaseIcon[Data Base]; System --> FurtherProcessing[Further Processing]; TestCase[Test Case] <--> System;</pre><p>35 Basic Testing © Copyright IBM Corporation 2015 IBM</p></div> | |

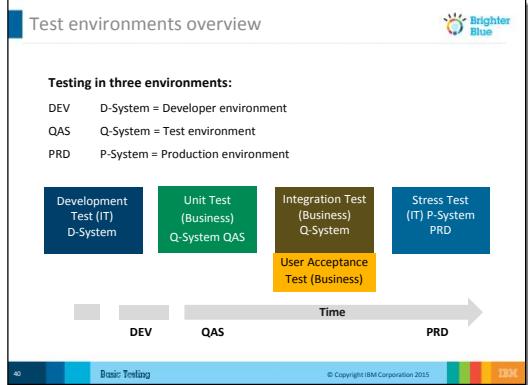
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| <p>Slide 35</p> <div style="border: 1px solid black; padding: 10px;"> <p>Test case description</p> <p>A test case is a set of conditions or variables under, which a tester will determine if a requirement upon an application is partially or fully satisfied.</p> <ul style="list-style-type: none"> 1. At least one test case is needed for each requirement 2. Test cases have to be created for each requirement 3. Normal operation is accepted. Different test cases are there for different roles. 4. Application without formal requirement is accepted. 5. Test Scripts are required. 6. The input is known and output is expected. </div> <p>At least one test case for each requirement - It may take many test cases to determine that a requirement is fully satisfied. In order to fully test that all the requirements of an application are met, there must be at least one test case for each requirement unless a requirement has sub requirements.</p> <p>Create test cases for each requirement - In that situation, each sub requirement must have at least one test case, or we should be creating at least two test cases for each requirement. One of them should perform positive testing of requirement and other should perform negative testing. Create Test cases for different roles (for example, manager view, user view, group, and so on).</p> | |

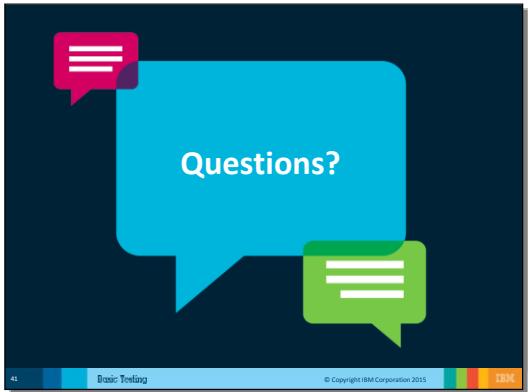
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| <p>Accepted normal operation - If the application is created without formal requirements, then test cases are written based on the accepted normal operation of programs of a similar class.</p> <p>Test cases for different roles - Create Test cases for different roles (for example, manager view, user view, group, and so on).</p> <p>Application without formal requirement - If the application is created without formal requirements, then test cases are written based on the accepted normal operation of programs of a similar class.</p> <p>Test Scripts - A test script is the executable form of a test.</p> <p>Known input and expected output - What characterizes a formal, written test case is that there is a known input and an expected output, which is worked out before the test is executed. The known input should test a precondition and the expected output should test a post condition.</p> | |

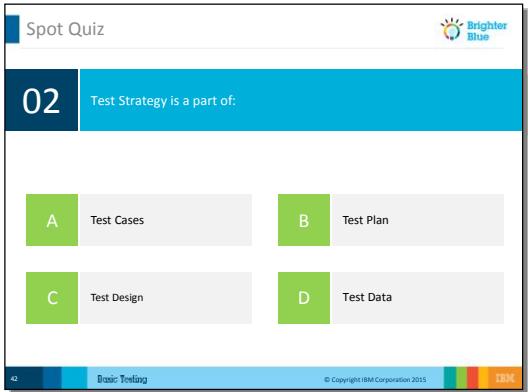
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| <p>Slide 36</p>  <pre> Test case format Environment It gives information about the testing environment. Test Setup It involves anything you need to set up outside of your application, for example printers, network, and so on. Test Execution It is detailed description of every step of execution. Expected Results It is the description of what you expect the function to do. Actual Results Passed or Failed: • If passed—This is what actually happens when you run the test • If failed—what is expected of the function to do" did not happen, and did not remove "you've observed" 37 Basic Testing © Copyright IBM Corporation 2015 IBM </pre> | |

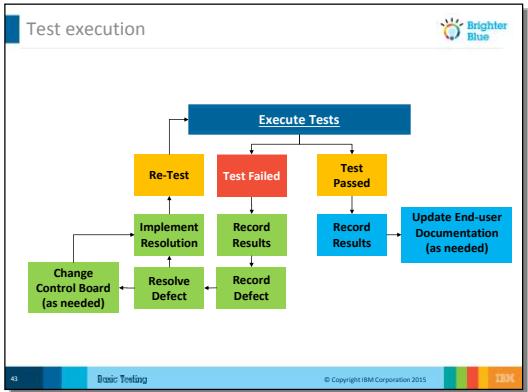
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| <p>Slide 37</p>  <p>A typical test case sheet contains the following fields ...</p> <p>Test case ID: It is a unique number given to test case in order to be identified.</p> <p>Test description: This is the description of test case you are going to test.</p> <p>Revision history: Each test case has to have its revision history in order to know when and by whom it is created or modified.</p> <p>Function to be tested: This is the name of function to be tested.</p> <p>Priority or build or time: The priority of the test case, build version of the test case and the minimum time-to-execute the test case are also mentioned.</p> | |

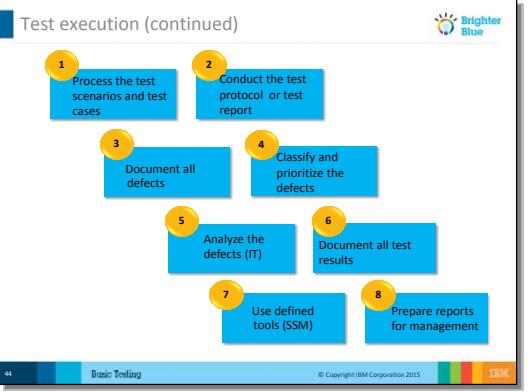
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| <p>Slide 38</p>  <pre> graph TD A[Prepare testing tool - Mercury Quality Center (QC)] --> B[Train testers] B --> C[Create test cases and test scenarios] C --> D[Create test schedule] D --> E[Build test client] </pre> <p>The flowchart illustrates the sequential steps of test preparation:</p> <ul style="list-style-type: none"> Test preparation (General title) Prepare testing tool - Mercury Quality Center (QC) <ul style="list-style-type: none"> Attend administrator training. Create project. Set up users. Load Test Requirements including Business Process Master List or BPML and lists of interfaces, enhancements, reports or forms. Train testers <ul style="list-style-type: none"> Identify testers. Conduct training. Create test cases and test scenarios <ul style="list-style-type: none"> Identify test scenarios and document in test matrix. Determine test cases with variants. Create test scenarios with description or step-by-step instructions, expected results, and data requirements. Create test schedule <ul style="list-style-type: none"> Develop test schedule. Obtain approval of test schedule. Develop detailed week 1 test schedule. Build test client <ul style="list-style-type: none"> Create Quality Assurance Client (QAC). Input MMUS specific data (test data and/or converted data) by April 13 for G or L Accounts, Cost centers, Profit centers, Vendors, and so on. <p>Source: Basic Testing © Copyright IBM Corporation 2015</p> | |

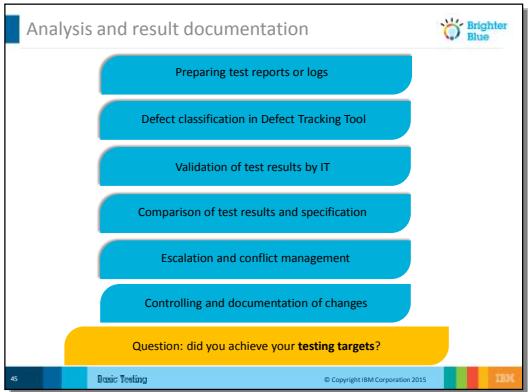
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| <p>Slide 39</p>  <p>The diagram illustrates the test environment timeline across three environments: DEV (Developer), QAS (Test), and PRD (Production). The timeline is represented by a horizontal arrow pointing from left to right, labeled 'Time'.</p> <ul style="list-style-type: none"> Development Test (IT) D-System: Located in the DEV phase. Unit Test (Business) Q-System QAS: Located in the QAS phase. Integration Test (Business) Q-System: Located in the QAS phase. User Acceptance Test (Business): Located in the PRD phase, highlighted with a yellow background. Stress Test (IT) P-System PRD: Located in the PRD phase. <p>Below the timeline, there is a legend with colored squares corresponding to the environments: DEV (blue), QAS (green), and PRD (orange).</p> | |

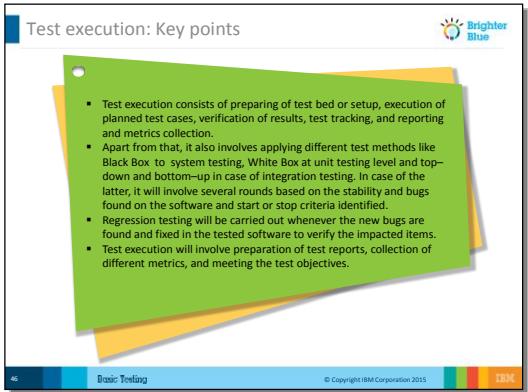
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| <p>Slide 40</p>  <p>The slide features a dark blue background. In the center is a large light blue speech bubble containing the text "Questions?". To its left is a small pink speech bubble with three horizontal lines, and to its right is a small green speech bubble with three horizontal lines. At the bottom of the slide, there is a thin blue footer bar with the text "Basic Testing" and "© Copyright IBM Corporation 2015" along with the IBM logo.</p> | |

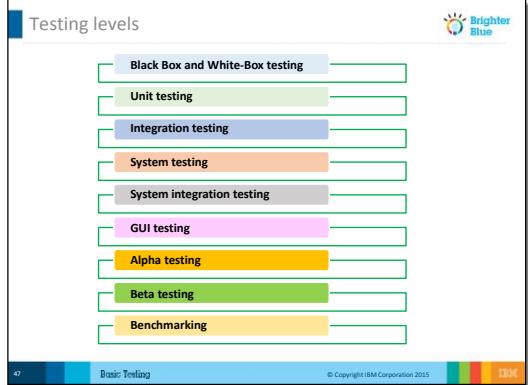
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| <p>Slide 41</p>  <p>The slide is titled "Spot Quiz" and shows question number "02". The question is "Test Strategy is a part of:". Below the question are four options labeled A, B, C, and D, each with a green square icon:</p> <ul style="list-style-type: none">A Test CasesB Test PlanC Test DesignD Test Data <p>At the bottom of the slide, there is a footer bar with the text "42", "Basic Testing", "© Copyright IBM Corporation 2015", and the IBM logo.</p> | |

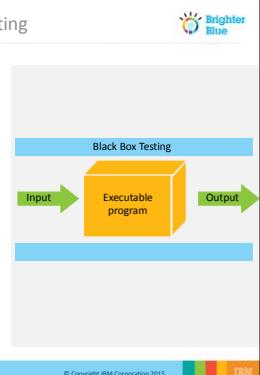
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| <p>Slide 42</p>  <pre>graph TD; Start[Test execution] --> Execute[Execute Tests]; Execute --> ReTest[Re-Test]; Execute --> Failed[Test Failed]; Execute --> Passed[Test Passed]; ReTest --> Implement[Implement Resolution]; Failed --> Record1[Record Results]; Passed --> Record2[Record Results]; Implement --> Change[Change Control Board (as needed)]; Record1 --> Resolve[Resolve Defect]; Record2 --> Update[Update End-user Documentation (as needed)]; Resolve --> Record3[Record Defect]; Change --> Record3;</pre> <p>The flowchart illustrates the Test execution process. It begins with 'Test execution' leading to 'Execute Tests'. From 'Execute Tests', three paths emerge: 'Re-Test', 'Test Failed', and 'Test Passed'. 'Re-Test' leads to 'Implement Resolution', which then feeds into 'Change Control Board (as needed)'. 'Test Failed' leads to 'Record Results', followed by 'Resolve Defect' and then 'Record Defect'. 'Test Passed' leads to 'Record Results', which then feeds into 'Update End-user Documentation (as needed)'. Finally, 'Record Defect' leads back to 'Change Control Board (as needed)'.</p> | |

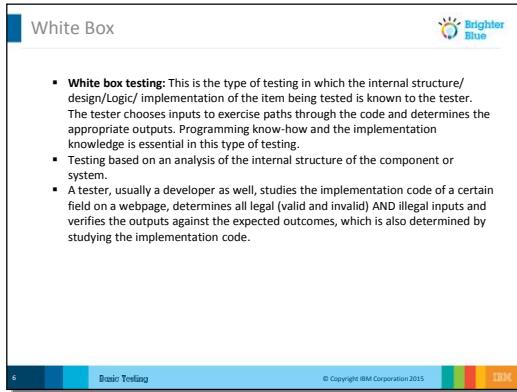
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| <p>Slide 43</p>  <p>The slide title is "Test execution (continued)". It features a numbered list of 8 steps:</p> <ol style="list-style-type: none">1 Process the test scenarios and test cases2 Conduct the test protocol or test report3 Document all defects4 Classify and prioritize the defects5 Analyze the defects (IT)6 Document all test results7 Use defined tools (SSM)8 Prepare reports for management <p>At the bottom, there is a navigation bar with icons for back, forward, and search, along with the text "Basic Testing" and "© Copyright IBM Corporation 2015".</p> | |

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| <p>Slide 44</p>  <p>The slide content is a list of six steps under the heading 'Analysis and result documentation':</p> <ul style="list-style-type: none">Preparing test reports or logsDefect classification in Defect Tracking ToolValidation of test results by ITComparison of test results and specificationEscalation and conflict managementControlling and documentation of changes <p>A yellow callout box at the bottom asks: 'Question: did you achieve your testing targets?'.</p> | |

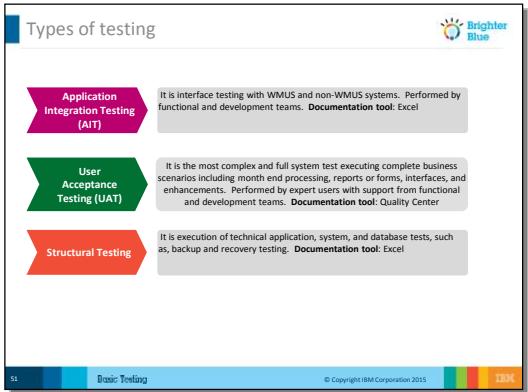
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| <p>Slide 45</p>  <p>The slide content is titled "Test execution: Key points". It contains a bulleted list of five items describing the process of test execution:</p> <ul style="list-style-type: none">Test execution consists of preparing of test bed or setup, execution of planned test cases, verification of results, test tracking, and reporting and metrics collection.Apart from that, it also involves applying different test methods like Black Box to system testing, White Box at unit testing level and top-down and bottom-up in case of integration testing. In case of the latter, it will involve several rounds based on the stability and bugs found on the software and start or stop criteria identified.Regression testing will be carried out whenever the new bugs are found and fixed in the tested software to verify the impacted items.Test execution will involve preparation of test reports, collection of different metrics, and meeting the test objectives. <p>At the bottom of the slide, there is a navigation bar with icons for back, forward, and search, and the text "Basic Testing" and "© Copyright IBM Corporation 2015".</p> | |

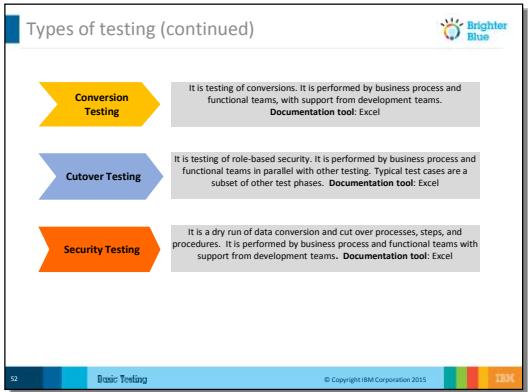
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| <p>Slide 46</p>  <p>47 Basic Testing © Copyright IBM Corporation 2015 IBM</p> | |

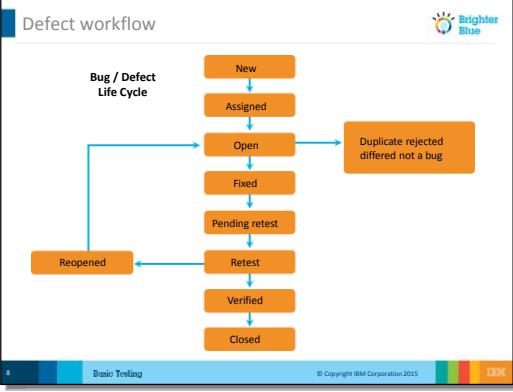
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| <p>Slide 47</p> <div style="border: 1px solid black; padding: 10px;"> <p>Black box and white box Testing</p> <p>Black box testing is either functional or non-functional, without reference to the internal structure of the component or system.</p> <p>Select test cases based on an analysis of the specification, either functional or non-functional, of a component or system without reference to its internal structure.</p> <p>Example</p> <ul style="list-style-type: none"> A tester, without knowledge of the internal structures of a website, tests the web pages by using a browser; providing inputs (clicks, keystrokes) and verifying the outputs against the expected outcome. (for example Gmail Page – Opening the URL enter Username Password and click on Submit - GMAIL Home Page to display).  </div> | |

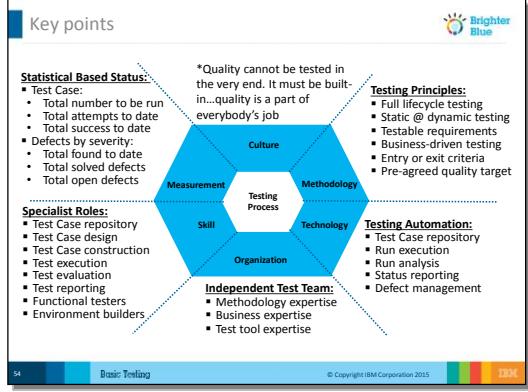
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| <p>Slide 48</p> <div data-bbox="454 432 971 824"><p>White Box</p><ul style="list-style-type: none">▪ White box testing: This is the type of testing in which the internal structure/design/Logic/ implementation of the item being tested is known to the tester. The tester chooses inputs to exercise paths through the code and determines the appropriate outputs. Programming know-how and the implementation knowledge is essential in this type of testing.▪ Testing based on an analysis of the internal structure of the component or system.▪ A tester, usually a developer as well, studies the implementation code of a certain field on a webpage, determines all legal (valid and invalid) AND illegal inputs and verifies the outputs against the expected outcomes, which is also determined by studying the implementation code.<p>6 Basic Testing © Copyright IBM Corporation 2015</p></div> | |

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| <p>Slide 49</p> <div style="border: 1px solid black; padding: 10px;"> <p>White Box (continued)</p> <p>A tester, usually a developer as well, studies the implementation code of a certain field on a webpage, determines all legal (valid and invalid) AND illegal inputs and verifies the outputs against the expected outcomes, which is also determined by studying the implementation code.</p> <p>For example, Gmail page login page has User name , Password and Submit Button , so the tester will see code of Submit button and all the other two text boxes Username and Password (legal (valid and invalid) AND illegal inputs) to see if they are performing their functions or not.</p> <p>Levels Applicable to:-</p> <p>White Box Testing method is applicable to the following levels of software testing:</p> <ul style="list-style-type: none"> ▪ Unit Testing: For testing paths within a unit. ▪ Integration Testing: For testing paths between units. ▪ System Testing: For testing paths between subsystems. </div> | |

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| <p>Slide 50</p>  <p>Types of testing</p> <ul style="list-style-type: none"> Application Integration Testing (AIT): It is interface testing with WMUS and non-WMUS systems. Performed by functional and development teams. Documentation tool: Excel User Acceptance Testing (UAT): It is the most complex and full system test executing complete business scenarios including month end processing, reports or forms, interfaces, and enhancements. Performed by expert users with support from functional and development teams. Documentation tool: Quality Center Structural Testing: It is execution of technical application, system, and database tests, such as, backup and recovery testing. Documentation tool: Excel <p>51 Basic Testing © Copyright IBM Corporation 2015 IBM</p> <p>AIT, UAT, Structural in one Conversion, cutover, security in second ----- phase wise.</p> <p>It is execution of technical application, system, and database tests, such as, backup and recovery testing. Documentation tool: Excel</p> | |

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| <p>Slide 51</p>  <p>The slide is titled "Types of testing (continued)". It features three sections with arrows pointing right:</p> <ul style="list-style-type: none">Conversion Testing: It is testing of conversions. It is performed by business process and functional teams, with support from development teams. Documentation tool: Excel.Cutover Testing: It is testing of role-based security. It is performed by business process and functional teams in parallel with other testing. Typical test cases are a subset of other test phases. Documentation tool: Excel.Security Testing: It is a dry run of data conversion and cut over processes, steps, and procedures. It is performed by business process and functional teams with support from development teams. Documentation tool: Excel. <p>At the bottom, it says "Basic Testing" and "© Copyright IBM Corporation 2015".</p> <p>AIT, UAT, Structural in one Conversion, cutover, security in second ----- phase wise.</p> | |

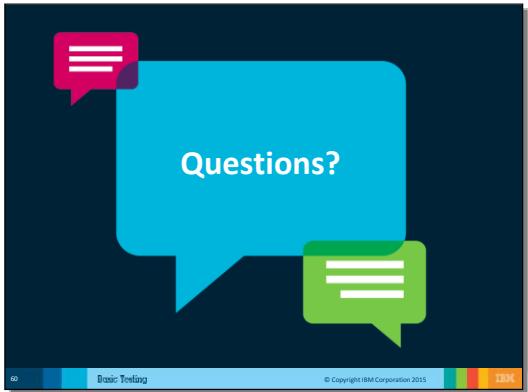
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| <p>Slide 52</p>  <p>On top is a workflow of a typical defect. The highlighted boxes outline the normal defect workflow, which equals defect status in Quality Centre. The yellow boxes reflect the exception defect workflow. The dashed boxes identify the state of the defect (open or closed).</p> | |

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| <p>Slide 53</p>  <p>The diagram illustrates the key points of testing through a central hexagon labeled 'Testing Process' surrounded by six interconnected components:</p> <ul style="list-style-type: none"> Statistical Based Status: <ul style="list-style-type: none"> Test Case: <ul style="list-style-type: none"> Total number to be run Total attempts to date Total found to date Defects by severity Total found to date Total solved defects Total open defects Culture: "Quality cannot be tested in the very end. It must be built-in...quality is a part of everybody's job" Methodology: Testing Principles: <ul style="list-style-type: none"> Full lifecycle testing Static @ dynamic testing Testable requirements Business-driven testing Entry or exit criteria Pre-agreed quality target Technology: Testing Automation: <ul style="list-style-type: none"> Test Case repository Run execution Run analysis Status reporting Defect management Organization: Independent Test Team: <ul style="list-style-type: none"> Methodology expertise Business expertise Test tool expertise Skill: Specialist Roles: <ul style="list-style-type: none"> Test Case repository Test Case design Test Case construction Test execution Test evaluation Test reporting Functional testers Environment builders | |

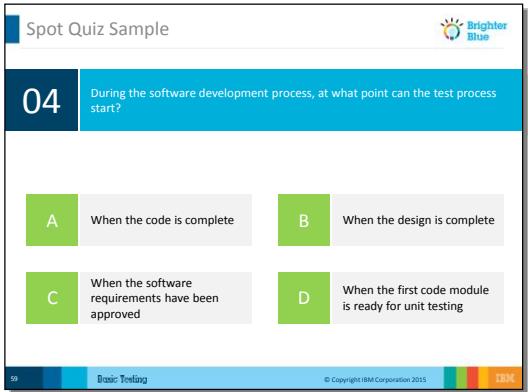
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| <p>Slide 54</p> <div data-bbox="451 432 982 824"><p>Testing lifecycle: Module summary</p><p>At the end of this module, you should now be able to:</p><ul style="list-style-type: none">Provide an overview of testing lifecycle and define common terms used in itExplain the different test strategies employedInterpret the steps involved in test planningDescribe the steps of a Test Case creationExplain how test execution is carried outDefine different types of testing levels<p>55 Basic Testing © Copyright IBM Corporation 2015 IBM</p></div> | |

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| <p>Slide 55</p> <div data-bbox="451 432 979 824"><p>Case study: Test lifecycle</p><p>Brighter Blue</p><ul style="list-style-type: none">Test case development:<ul style="list-style-type: none">Several test cases will be generated as per the test strategy and plan for user interface, functionality and error handling of Global Print in W3.Integration and system test cases will be generated to test for the application.Test report:<ul style="list-style-type: none">Test cases will be executed and test results will be recorded and tracked.After bugs are fixed, the system is tested again to verify the same.The whole system is also tested to verify that new bugs have not been introduced.<p> Test Case and Defect Log Template  Test Summary Template</p><p>56 Basic Testing © Copyright IBM Corporation 2015 IBM</p></div> <p>Refer to the Supporting Documents_Day 1 folder for the embedded files.</p> | |

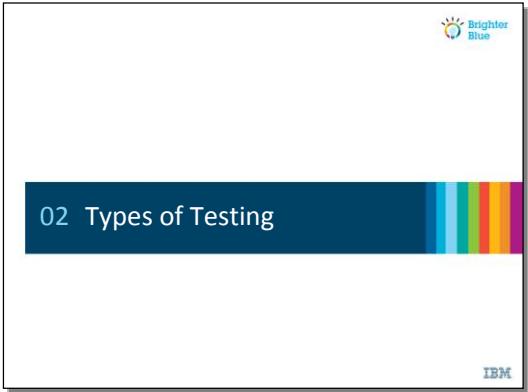
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| <p>Slide 56</p> <div data-bbox="451 432 982 824"><p>Case study: Test lifecycle (continued) </p><p>Prepare Requirements Traceability Matrix for "Case Study."</p><p> Requirements Traceability Matrix</p><p>57 Basic Testing © Copyright IBM Corporation 2015 </p></div> <p>Refer to the Supporting Documents_Day 1 folder for the embedded files.</p> | |

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| <p>Slide 57</p>  <p>The slide features a dark blue background. In the center is a large light blue speech bubble containing the text "Questions?". To its left is a small pink speech bubble with three horizontal lines, and to its right is a small green speech bubble with three horizontal lines. At the bottom of the slide, there is a thin blue footer bar with the text "Basic Testing" and "© Copyright IBM Corporation 2015" along with the IBM logo.</p> | |

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| <p>Slide 58</p> <div data-bbox="451 432 982 824"><p>Spot Quiz Sample</p><p>03 Which of the following is Solution Defining activity and not the Build activity of SDLC?</p><p>A Feasibility study B Coding</p><p>C Testing D Maintenance</p><p>SB Basic Testing © Copyright IBM Corporation 2015 IBM</p></div> <p>The correct answer is A. Feasibility study</p> | |

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| <p>Slide 59</p>  <p>The slide shows a quiz question from 'Spot Quiz Sample' slide 04. The question asks: 'During the software development process, at what point can the test process start?'. The options are:</p> <ul style="list-style-type: none">A When the code is completeB When the design is completeC When the software requirements have been approvedD When the first code module is ready for unit testing <p>The correct answer is C. When the software requirements have been approved</p> | |

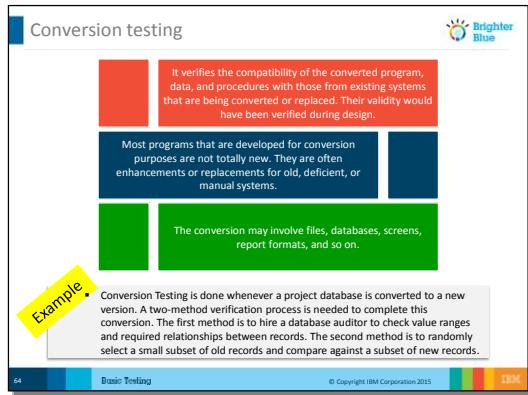
Module 2: Types and Levels of Testing

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| <p>Slide 60</p>  <p>At the end of this module, you should be able to:</p> <ul style="list-style-type: none">▪ Describe the different types of Functional testing▪ Outline the different types of Structural testing▪ Use examples of each type for better explanation and clarity of understanding | |

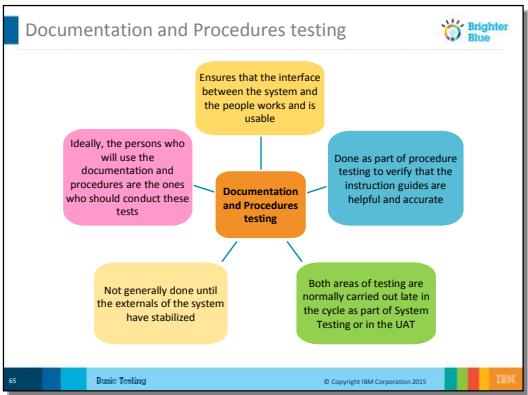
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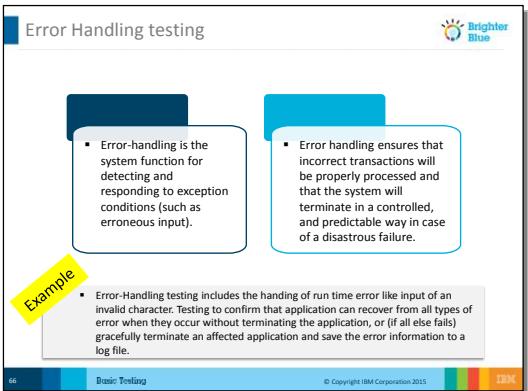
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| <p>Slide 61</p>  <p>The slide content is a diagram titled "Functional testing" showing various types of functional testing. The categories are arranged in a grid:</p> <ul style="list-style-type: none">Audit and Controls testingConversion testingDocumentation and Procedures testingError Handling testingFunctional testingInterface / Inter-system testingParallel testingRegression testingTransaction Flow testingInstallation testingUsability testing <p>At the bottom of the slide, there is a navigation bar with icons for back, forward, and search, and the text "62 Basic Testing".</p> | |

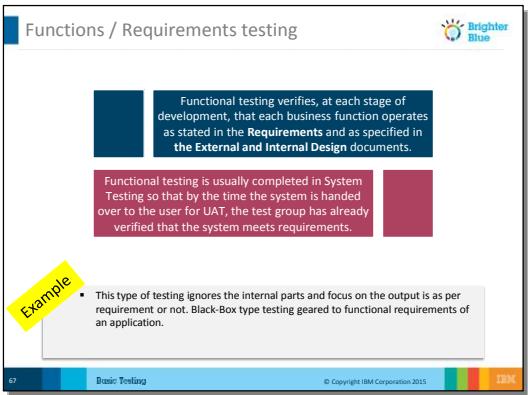
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| <p>Slide 62</p> <div style="border: 1px solid #ccc; padding: 10px;"> <p>Audit and Controls testing</p>  <p>It verifies the adequacy and effectiveness of controls and ensures the capability to prove the completeness of data processing results:</p> <ul style="list-style-type: none"> ▪ Their validity would have been verified during design. ▪ This would have been normally carried out as part of System Testing once the primary application functions have stabilized. <p>Examples</p> <ul style="list-style-type: none"> ▪ Inquiries of appropriate management, supervisor, and staff personnel ▪ Inspection of documents, reports, and electronic files ▪ Observation of the application of specific controls ▪ Re-performance of the application of the control by the auditors <p>62 Basic Testing © Copyright IBM Corporation 2015 </p> </div> | |

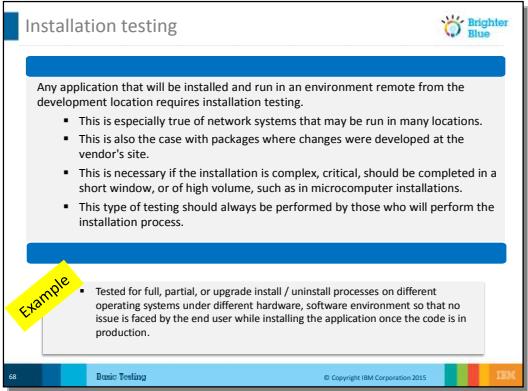
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| <p>Slide 63</p> <div data-bbox="413 421 941 816"> <p>Conversion testing</p>  <p>Conversion testing</p> <p>It verifies the compatibility of the converted program, data, and procedures with those from existing systems that are being converted or replaced. Their validity would have been verified during design.</p> <p>Most programs that are developed for conversion purposes are not totally new. They are often enhancements or replacements for old, deficient, or manual systems.</p> <p>The conversion may involve files, databases, screens, report formats, and so on.</p> <p>Example. Conversion Testing is done whenever a project database is converted to a new version. A two-method verification process is needed to complete this conversion. The first method is to hire a database auditor to check value ranges and required relationships between records. The second method is to randomly select a small subset of old records and compare against a subset of new records.</p> <p>64 Basic Testing © Copyright IBM Corporation 2015 IBM</p> </div> <p>Example: Conversion Testing is done whenever a project database is converted to a new version. The First verification method involves the use of a database auditor that must be built by the development group. When ran against the converted database, the database auditor will check value ranges within a record and the required relationships between records. The second verification method involves the random selection of a small subset of old records and then a direct comparison against a corresponding subset of the new records.</p> | |

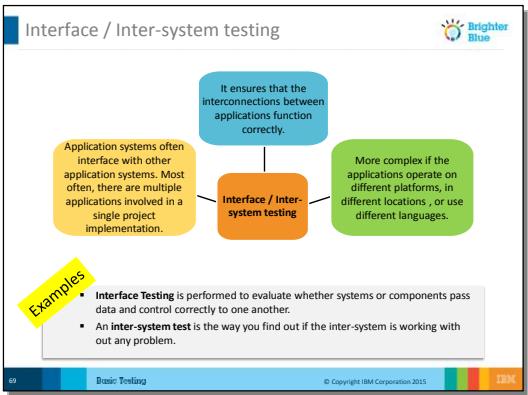
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| <p>Slide 64</p>  <pre> graph TD A[Documentation and Procedures testing] --- B["Ensures that the interface between the system and the people works and is usable"] A --- C["Done as part of procedure testing to verify that the instruction guides are helpful and accurate"] A --- D["Both areas of testing are normally carried out late in the cycle as part of System Testing or in the DAT"] A --- E["Not generally done until the externals of the system have stabilized"] A --- F["Ideally, the persons who will use the documentation and procedures are the ones who should conduct these tests"] </pre> <p>65 Basic Testing © Copyright IBM Corporation 2015 </p> <p>Example: Documentation is as important to a product's success as the product itself. If the documentation is poor, non-existent, or wrong, it reflects on the quality of the product. Document testing includes any type of document verification—test case specification, test incident report, test log, test plan, test procedure, and test report.</p> | |

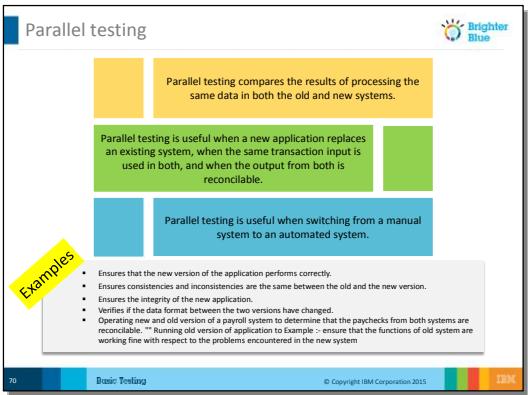
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| <p>Slide 65</p>  <p>The slide content is as follows:</p> <p>Error Handling testing</p> <ul style="list-style-type: none">▪ Error-handling is the system function for detecting and responding to exception conditions (such as erroneous input).▪ Error handling ensures that incorrect transactions will be properly processed and that the system will terminate in a controlled, and predictable way in case of a disastrous failure. <p>Example</p> <ul style="list-style-type: none">▪ Error-Handling testing includes the handing of run time error like input of an invalid character. Testing to confirm that application can recover from all types of error when they occur without terminating the application, or (if all else fails) gracefully terminate an affected application and save the error information to a log file. <p>66 Basic Testing © Copyright IBM Corporation 2015 </p> | |

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| <p>Slide 66</p>  <p>The slide content is as follows:</p> <p>Functions / Requirements testing</p> <p>Functional testing verifies, at each stage of development, that each business function operates as stated in the Requirements and as specified in the External and Internal Design documents.</p> <p>Functional testing is usually completed in System Testing so that by the time the system is handed over to the user for UAT, the test group has already verified that the system meets requirements.</p> <p>Example</p> <ul style="list-style-type: none">This type of testing ignores the internal parts and focus on the output is as per requirement or not. Black-Box type testing geared to functional requirements of an application. <p>67 Basic Testing © Copyright IBM Corporation 2015 IBM</p> | |

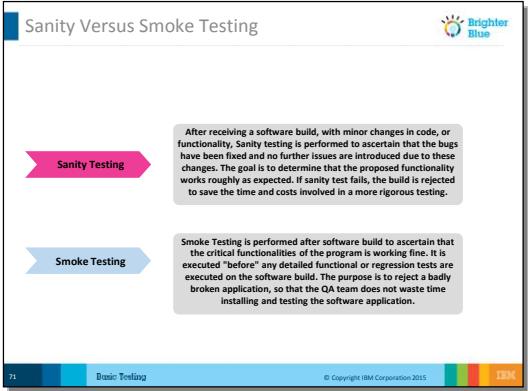
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| <p>Slide 67</p>  <p>Installation testing</p> <p>Any application that will be installed and run in an environment remote from the development location requires installation testing.</p> <ul style="list-style-type: none"> ▪ This is especially true of network systems that may be run in many locations. ▪ This is also the case with packages where changes were developed at the vendor's site. ▪ This is necessary if the installation is complex, critical, should be completed in a short window, or of high volume, such as in microcomputer installations. ▪ This type of testing should always be performed by those who will perform the installation process. <p>Example</p> <ul style="list-style-type: none"> • Tested for full, partial, or upgrade install / uninstall processes on different operating systems under different hardware, software environment so that no issue is faced by the end user while installing the application once the code is in production. <p>68 Basic Testing © Copyright IBM Corporation 2015</p> | |

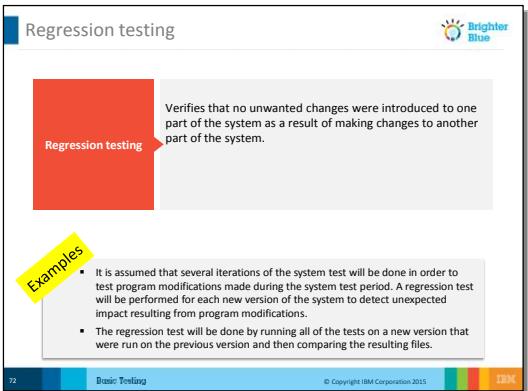
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| <p>Slide 68</p>  <p>Interface / Inter-system testing</p> <p>Application systems often interface with other application systems. Most often, there are multiple applications involved in a single project implementation.</p> <p>It ensures that the interconnections between applications function correctly.</p> <p>More complex if the applications operate on different platforms, in different locations, or use different languages.</p> <p>Interface / Inter-system testing</p> <p>Examples</p> <ul style="list-style-type: none"> Interface Testing is performed to evaluate whether systems or components pass data and control correctly to one another. An inter-system test is the way you find out if the inter-system is working without any problem. <p>68 Basic Testing © Copyright IBM Corporation 2015 IBM</p> <p>Example: Interface Testing is performed to evaluate whether systems or components pass data and control correctly to one another. It is to verify if all the interactions between these modules are working properly and errors are handled properly.</p> <p>An inter-system test, for example, could be a memory map, showing what is in memory at that moment. It basically is the way you find out if the inter-system is working without any problem, and is a big help when you do have a problem in finding a fix for it.</p> | |

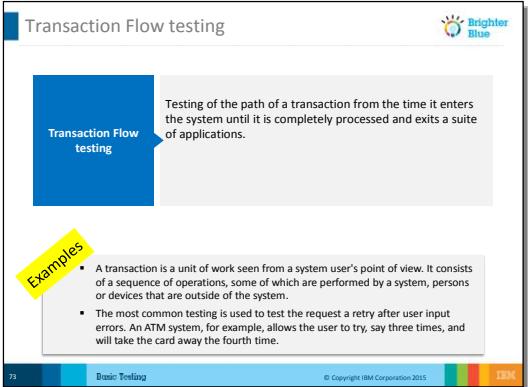
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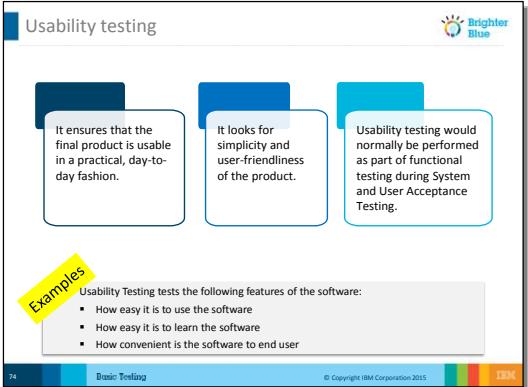
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| <p>Slide 69</p>  <p>Parallel testing</p> <p>Parallel testing compares the results of processing the same data in both the old and new systems.</p> <p>Parallel testing is useful when a new application replaces an existing system, when the same transaction input is used in both, and when the output from both is reconcilable.</p> <p>Parallel testing is useful when switching from a manual system to an automated system.</p> <p>Examples:</p> <ul style="list-style-type: none"> Ensures that the new version of the application performs correctly. Ensures consistencies and inconsistencies are the same between the old and the new version. Ensures the integrity of the new application. Verifies if the data format between the two versions have changed. Operating new and old version of a payroll system to determine that the paychecks from both systems are reconcilable. "Running old version of application to example :- ensure that the functions of old system are working fine with respect to the problems encountered in the new system <p>70 Basic Testing © Copyright IBM Corporation 2015</p> | |

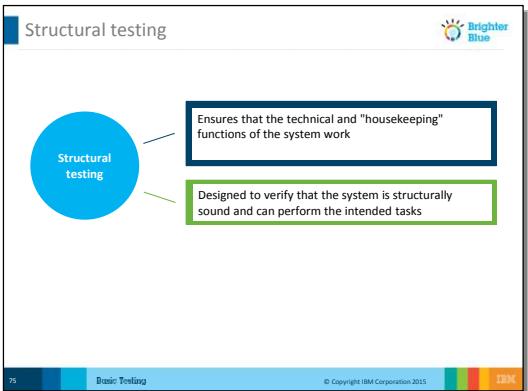
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| <p>application to Example: - ensure that the functions of old system are working fine with respect to the problems encountered in the new system.</p> | |

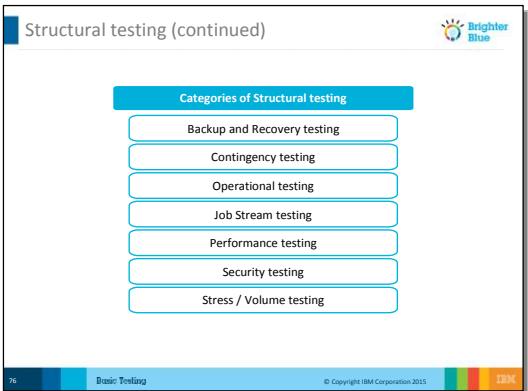
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| <p>Slide 70</p>  | |

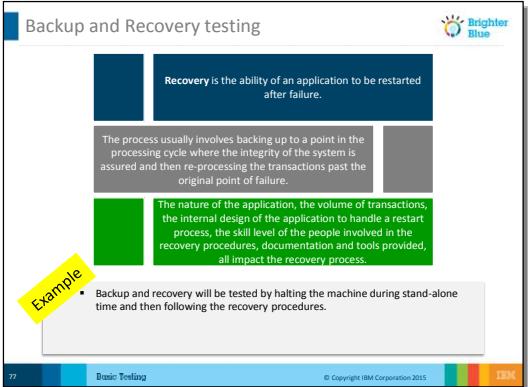
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| <p>Slide 71</p>  <p>The slide has a blue header bar with the title 'Regression testing'. Below the title is a red box containing the text: 'Verifies that no unwanted changes were introduced to one part of the system as a result of making changes to another part of the system.' To the right of this text is a white box with a yellow arrow pointing to it, labeled 'Examples'. Inside this box are two bullet points:</p> <ul style="list-style-type: none">▪ It is assumed that several iterations of the system test will be done in order to test program modifications made during the system test period. A regression test will be performed for each new version of the system to detect unexpected impact resulting from program modifications.▪ The regression test will be done by running all of the tests on a new version that were run on the previous version and then comparing the resulting files. <p>The footer of the slide includes the number '72', the title 'Basic Testing', and the IBM logo.</p> | |

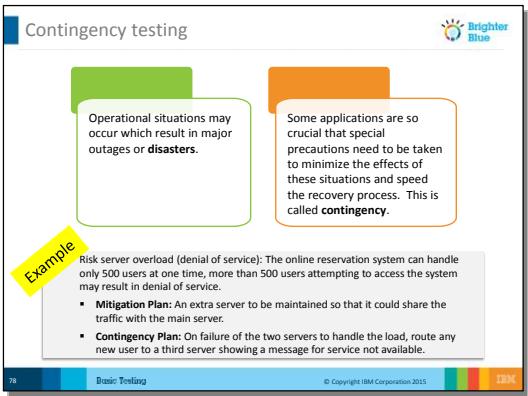
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| <p>Slide 72</p>  <p>Slide Content</p> <p>Slide 72</p> <p>Transaction Flow testing</p> <p>Testing of the path of a transaction from the time it enters the system until it is completely processed and exits a suite of applications.</p> <p>Examples</p> <ul style="list-style-type: none">▪ A transaction is a unit of work seen from a system user's point of view. It consists of a sequence of operations, some of which are performed by a system, persons or devices that are outside of the system.▪ The most common testing is used to test the request a retry after user input errors. An ATM system, for example, allows the user to try, say three times, and will take the card away the fourth time. <p>73 Basic Testing © Copyright IBM Corporation 2015 IBM</p> | |

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| <p>Slide 73</p>  <p>The slide content is as follows:</p> <p>Usability testing</p> <p>It ensures that the final product is usable in a practical, day-to-day fashion.</p> <p>It looks for simplicity and user-friendliness of the product.</p> <p>Usability testing would normally be performed as part of functional testing during System and User Acceptance Testing.</p> <p>Examples</p> <p>Usability Testing tests the following features of the software:</p> <ul style="list-style-type: none">▪ How easy it is to use the software▪ How easy it is to learn the software▪ How convenient is the software to end user <p>74 Basic Testing © Copyright IBM Corporation 2015 IBM</p> | |

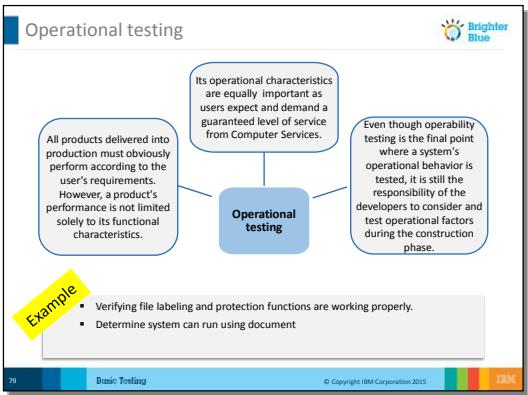
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| <p>Slide 74</p>  <p>The slide content is a screenshot of an IBM presentation slide titled "Structural testing". It features a blue circular icon labeled "Structural testing" on the left. Two callout boxes extend from the icon: one in a dark blue box stating "Ensures that the technical and "housekeeping" functions of the system work", and one in a green box stating "Designed to verify that the system is structurally sound and can perform the intended tasks". The slide footer includes the number "75", the title "Basic Testing", copyright information "© Copyright IBM Corporation 2015", and the IBM logo.</p> | |

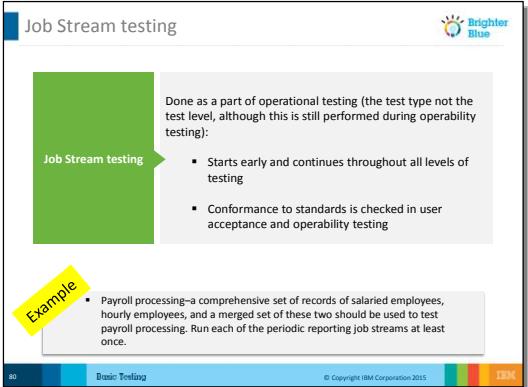
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| <p>Slide 75</p>  <p>The slide is titled "Structural testing (continued)" and features a list of "Categories of Structural testing" on the right side. The categories listed are:</p> <ul style="list-style-type: none">Backup and Recovery testingContingency testingOperational testingJob Stream testingPerformance testingSecurity testingStress / Volume testing <p>At the bottom left, it says "76 Basic Testing". At the bottom right, there is a copyright notice "© Copyright IBM Corporation 2015" followed by the IBM logo.</p> | |

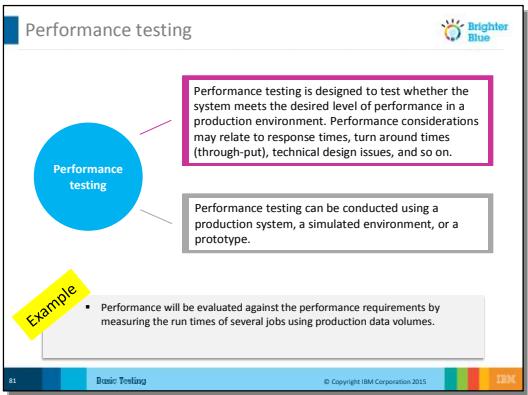
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| <p>Slide 76</p>  <p>The slide content is as follows:</p> <ul style="list-style-type: none"> Backup and Recovery testing Recovery is the ability of an application to be restarted after failure. The process usually involves backing up to a point in the processing cycle where the integrity of the system is assured and then re-processing the transactions past the original point of failure. The nature of the application, the volume of transactions, the internal design of the application to handle a restart process, the skill level of the people involved in the recovery procedures, documentation and tools provided, all impact the recovery process. Example <ul style="list-style-type: none"> Backup and recovery will be tested by halting the machine during stand-alone time and then following the recovery procedures. <p>77 Basic Testing © Copyright IBM Corporation 2015</p> | |

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| <p>Slide 77</p>  <p>Example</p> <p>Risk server overload (denial of service): The online reservation system can handle only 500 users at one time, more than 500 users attempting to access the system may result in denial of service.</p> <ul style="list-style-type: none"> ▪ Mitigation Plan: An extra server to be maintained so that it could share the traffic with the main server ▪ Contingency Plan: On failure of the two servers to handle the load, route any new user to a third server showing a message for service not available. <p>78 Basic Testing © Copyright IBM Corporation 2015</p> | |

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| <p>Contingency Plan: On failure of the two servers to handle the load, route any new user to a third server showing a message for service not available.</p> | |

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| <p>Slide 78</p>  <p>The slide is titled "Operational testing". It features a central box labeled "Operational testing" with three callout boxes pointing to it:</p> <ul style="list-style-type: none"> All products delivered into production must obviously perform according to the user's requirements. However, a product's performance is not limited solely to its functional characteristics. Its operational characteristics are equally important as users expect and demand a guaranteed level of service from Computer Services. Even though operability testing is the final point where a system's operational behavior is tested, it is still the responsibility of the developers to consider and test operational factors during the construction phase. <p>A yellow "Example" callout points to a list of two items:</p> <ul style="list-style-type: none"> Verifying file labeling and protection functions are working properly. Determine system can run using document <p>At the bottom left is the page number "79" and the title "Basic Testing". At the bottom right are the IBM and Brighter Blue logos.</p> <p>Example: To verify that before application goes to production the operating procedures and staff can properly execute the application. Evaluation of process and execution of process.</p> <ul style="list-style-type: none"> Verifying file labeling and protection functions are working properly. Determine system can run using document | |

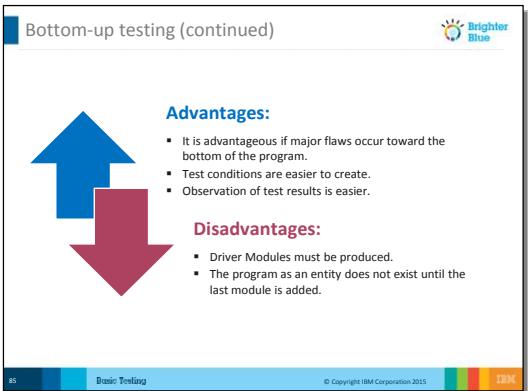
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| <p>Slide 79</p>  <p>The slide content is titled "Job Stream testing". It includes a green callout box with the following text:</p> <p>Done as a part of operational testing (the test type not the test level, although this is still performed during operability testing):</p> <ul style="list-style-type: none">▪ Starts early and continues throughout all levels of testing▪ Conformance to standards is checked in user acceptance and operability testing <p>A yellow sticky note labeled "Example" contains the following text:</p> <ul style="list-style-type: none">▪ Payroll processing—a comprehensive set of records of salaried employees, hourly employees, and a merged set of these two should be used to test payroll processing. Run each of the periodic reporting job streams at least once. <p>The slide footer includes the number 80, the title "Basic Testing", and the IBM logo.</p> | |

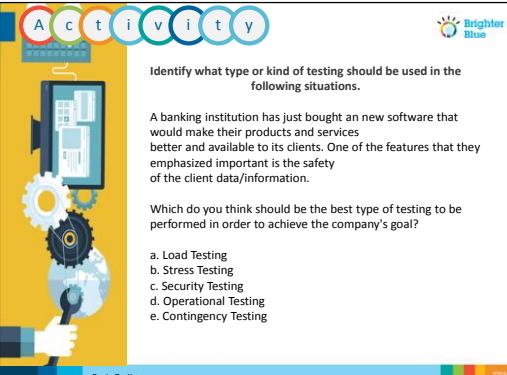
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| <p>Slide 80</p>  <p>The slide content is as follows:</p> <p>Performance testing</p> <p>Performance testing is designed to test whether the system meets the desired level of performance in a production environment. Performance considerations may relate to response times, turn around times (through-put), technical design issues, and so on.</p> <p>Performance testing can be conducted using a production system, a simulated environment, or a prototype.</p> <p>Example</p> <ul style="list-style-type: none">Performance will be evaluated against the performance requirements by measuring the run times of several jobs using production data volumes. <p>81 Basic Testing © Copyright IBM Corporation 2015</p> | |

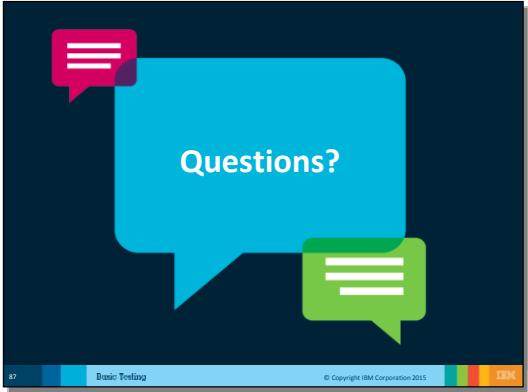
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| <p>Slide 81</p> <div style="border: 1px solid #ccc; padding: 10px;"> <p>Security testing</p> <p>■ Security of an application system is required to ensure the protection of confidential information in a system and in other affected systems is protected against loss, corruption, or misuse; either by deliberate or accidental actions.</p> <p>■ The amount of testing needed depends on the risk assessment of the consequences of a breach in security. Tests should focus on, and be limited to those security features developed as part of the system.</p> <p>Example</p> <ul style="list-style-type: none"> Attempted access without a proper password to the on-line data entry and display transactions (notification to the user of invalid authentication) will be tested. </div> <p>82 Basic Testing © Copyright IBM Corporation 2015 </p> <p>Example: Attempted access without a proper password to the on-line data entry and display transactions (notification to the user of invalid authentication) will be tested.</p> <p>Can system be penetrated by any hacking way? Test how well the system protects against unauthorized internal or external access. Check if system database is safe from external attacks.</p> | |

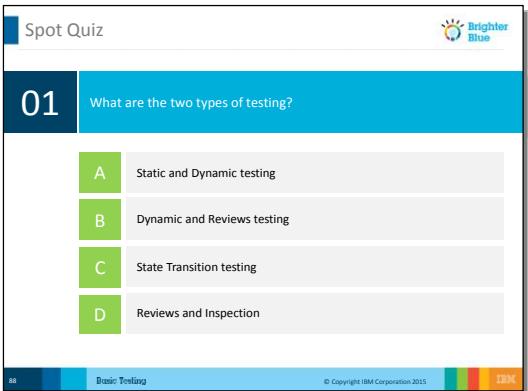
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| <p>Slide 82</p> <div style="border: 1px solid #ccc; padding: 10px;"> <p>Stress / Volume testing</p> <p>Stress testing is defined as the processing of a large number of transactions through the system in a defined period of time. It is done to measure the performance characteristics of the system under peak load conditions.</p> <p>Stress factors may apply to different aspects of the system, such as input transactions, report lines, internal tables, communications, computer processing capacity, throughput, disk space, I/O, and so on.</p> <p>Stress testing should not begin until the system functions are fully tested and stable. The need for Stress Testing must be identified in the Design Phase and should commence as soon as operationally stable system units are available.</p> <p>Example</p> <ul style="list-style-type: none"> System is stressed beyond its specifications to check how and when it fails. Performed under heavy load like putting large number beyond storage capacity, complex database queries, and continuous input to system or database load. <p>82 Basic Testing © Copyright IBM Corporation 2015 </p> </div> | |

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| <p>Slide 83</p> <div data-bbox="416 421 941 816"><p>Bottom-up testing</p><p>Bottom-up testing</p><ul style="list-style-type: none">▪ Approach to integration testing where the lowest level components are tested first and then used to facilitate the testing of higher level components▪ This process is repeated until the component at the top of the hierarchy is tested. In this approach, testing is conducted from sub module to main module; if the main module is not developed, a temporary program called Drivers is used to simulate the main module.<p>84 Basic Testing © Copyright IBM Corporation 2015 </p></div> | |

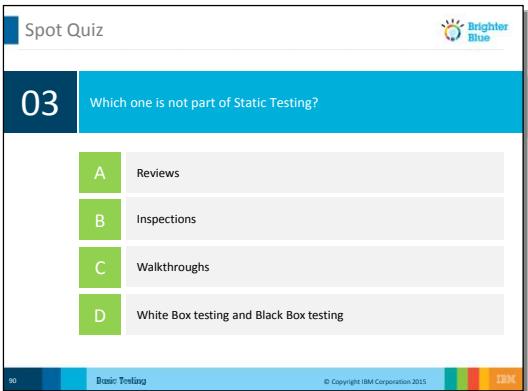
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| <p>Slide 84</p>  <p>Advantages:</p> <ul style="list-style-type: none"> ▪ It is advantageous if major flaws occur toward the bottom of the program. ▪ Test conditions are easier to create. ▪ Observation of test results is easier. <p>Disadvantages:</p> <ul style="list-style-type: none"> ▪ Driver Modules must be produced. ▪ The program as an entity does not exist until the last module is added. <p>85 Basic Testing © Copyright IBM Corporation 2015 </p> <p>Example: For Unit Testing of “Sales Order Printing” program, a Driver program will have the code which will create Sales Order records using hardcoded data and then call “Sales Order Printing” program.</p> | |

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| <p>Slide 85</p> <div style="border: 1px solid black; padding: 10px;">  <p>Identify what type or kind of testing should be used in the following situations.</p> <p>A banking institution has just bought an new software that would make their products and services better and available to its clients. One of the features that they emphasized important is the safety of the client data/information.</p> <p>Which do you think should be the best type of testing to be performed in order to achieve the company's goal?</p> <p>a. Load Testing b. Stress Testing c. Security Testing d. Operational Testing e. Contingency Testing</p> <p>86 Basic Testing © Copyright IBM Corporation 2015 </p> </div> <p>Identify what type or kind of testing should be used in the following situations provided by the instructor:</p> <ul style="list-style-type: none"> ■ Is the example given / provided require Functional or Structural testing? <p>The correct answer is C. Security Testing</p> | |

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| <p>Slide 86</p>  <p>The slide features a dark blue background. In the center is a large light blue speech bubble containing the text "Questions?". Above it is a small pink speech bubble with three horizontal lines. Below it is a green speech bubble with three horizontal lines. At the bottom of the slide, there is a navigation bar with several colored squares and the text "87 Basic Testing © Copyright IBM Corporation 2015 IBM".</p> | |

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| <p>Slide 87</p>  <p>The slide displays a 'Spot Quiz' interface. At the top left is a blue square icon with a white 'i'. To its right is the text 'Spot Quiz'. In the top right corner is the 'Brighter Blue' logo. Below this, the question '01 What are the two types of testing?' is displayed. Four options are listed below the question:<ul style="list-style-type: none">A Static and Dynamic testingB Dynamic and Reviews testingC State Transition testingD Reviews and InspectionAt the bottom of the slide, there is a navigation bar with several colored squares and the text 'Basic Testing'. On the far right of the bar is the 'IBM' logo.</p> | |

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| <p>Slide 88</p> <div data-bbox="418 421 946 812"><p>Spot Quiz</p><p>02 Which of the following is a purpose for Regression testing?</p><p>A To check that new functionality has been added or not</p><p>B To check that the existing functionality has been changed</p><p>C To check that no unwanted changes were introduced to one part of the system as a result of making changes to another part of the system</p><p>88 Basic Testing © Copyright IBM Corporation 2015 IBM</p></div> | |

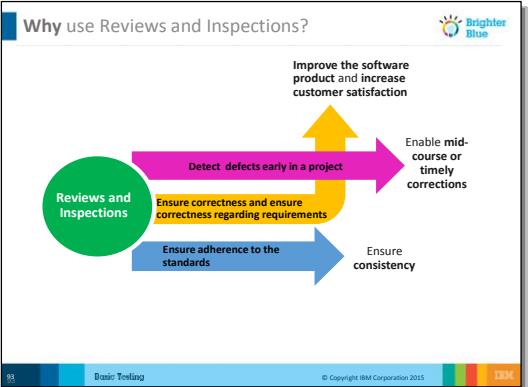
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| <p>Slide 89</p>  <p>03 Which one is not part of Static Testing?</p> <ul style="list-style-type: none">A ReviewsB InspectionsC WalkthroughsD White Box testing and Black Box testing <p>90 Basic Testing © Copyright IBM Corporation 2015 IBM</p> | |

Module 3: Types and Levels of Testing

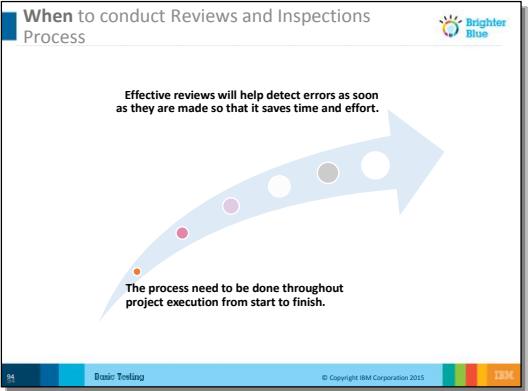
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| <p>Slide 90</p>  <p>At the end of this module, you should be able to:</p> <ul style="list-style-type: none">▪ Recognize the features of reviews and inspections▪ Recognize the benefits of reviews and inspections▪ Recognize the steps in the reviews and inspection processes▪ Show the importance of reviews and inspection through some real-life incidents▪ Compare peer and facilitation reviews | |

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| <ul style="list-style-type: none">▪ Recognize the key features of defect classification▪ Explain how Return on Investment (ROI) helps to justify the cost of reviews | |

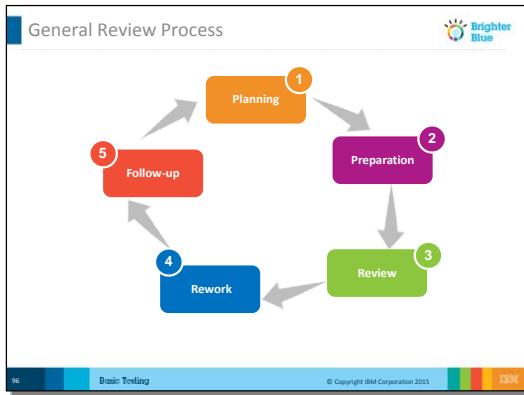
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| <p>Slide 91</p>  <p>A methodical examination of software work products: Reviews and Inspections is a methodical examination of software work products generated at different phases of software development life cycle or modified during maintenance (for example, code change for a bug in an existing software).</p> | |

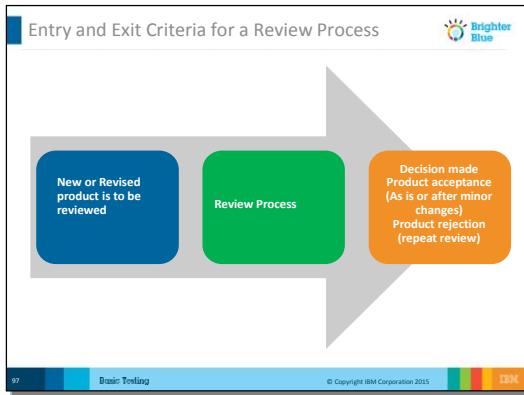
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| <p>Slide 92</p>  <p>Why use Reviews and Inspections?</p> <p>The slide illustrates the benefits of reviews and inspections through a central green circle labeled "Reviews and Inspections". Four arrows point from this circle to the right, each representing a benefit:</p> <ul style="list-style-type: none"> A yellow arrow points upwards, labeled "Improve the software product and increase customer satisfaction". A pink arrow points diagonally upwards and to the right, labeled "Detect defects early in a project". An orange arrow points diagonally downwards and to the right, labeled "Ensure correctness and ensure correctness regarding requirements". A blue arrow points horizontally to the right, labeled "Ensure adherence to the standards". <p>Below the main diagram, there is a navigation bar with icons for back, forward, and search, followed by the text "Basic Testing" and "© Copyright IBM Corporation 2015".</p> <p>Why? It helps to:</p> <ul style="list-style-type: none"> • Detect defects early in a project so as to enable mid-course or timely corrections. • Ensure correctness and consistency with respect to requirements, thus improving the software product and increasing customer satisfaction. • Ensure adherence to the standards (set by IBM or customer). | |

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| <p>Slide 93</p>  <p>When to conduct Reviews and Inspections Process</p> <p>Effective reviews will help detect errors as soon as they are made so that it saves time and effort.</p> <p>The process need to be done throughout project execution from start to finish.</p> <p>Basic Testing © Copyright IBM Corporation 2015 IBM</p> | |

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| <p>Slide 94</p> <div data-bbox="392 421 918 812"><p>How to conduct Reviews and Inspections process </p><p>There are several methods in conducting reviews and inspections.</p><div data-bbox="475 563 813 660"><p>Peer Review</p><p>Formal Inspections</p></div><p>IBM Basic Testing © Copyright IBM Corporation 2015</p></div> <p>There are several methods involved in conducting reviews and inspections; for example, peer review and formal inspections.</p> | |

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| <p>Slide 95</p> <div data-bbox="392 421 916 816"><p>General Review Process</p><pre>graph TD; A[Planning] --> B[Preparation]; B --> C[Review]; C --> D[Rework]; D --> E[Follow-up]; E --> A</pre><p>The flowchart illustrates the General Review Process. It consists of five sequential steps: Planning (orange), Preparation (purple), Review (green), Rework (blue), and Follow-up (red). Arrows indicate a clockwise cycle, with a feedback loop from Follow-up back to Planning.</p><p>Basic Testing</p><p>© Copyright IBM Corporation 2015</p><p>IBM</p></div> <p>The following illustrates the general review process.</p> | |

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| <p>Slide 96</p> <div data-bbox="392 421 916 816"><p>Entry and Exit Criteria for a Review Process</p><p>The diagram illustrates the entry and exit criteria for a review process. It features three main components: a blue rounded rectangle labeled "New or Revised product is to be reviewed", a green rounded rectangle labeled "Review Process", and an orange rounded rectangle labeled "Decision made". A large grey arrow points from the "Review Process" box to the "Decision made" box. Below the diagram, there is footer information: "Basic Testing" and "© Copyright IBM Corporation 2015".</p><p>New or Revised product is to be reviewed</p><p>Review Process</p><p>Decision made Product acceptance (As is or after minor changes) Product rejection (repeat review)</p><p>Basic Testing</p><p>© Copyright IBM Corporation 2015</p></div> <p>The following diagram illustrates the entry and exit criteria for a review process.</p> | |

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| <p>Slide 97</p>  <p>The slide is titled "Tom's Story: Setting up the Christmas Tree" and features the Brighter Blue logo. It shows two black silhouettes of people, a man and a woman, standing side-by-side. Below the silhouettes is a yellow text box containing the story: "Tom and his wife Pam are busy preparing for Christmas. They decide that Tom would buy and set up the Christmas tree, while Pam is out shopping for the gifts." At the bottom of the slide, there is a navigation bar with icons for back, forward, and search, followed by the text "Basic Testing" and the IBM logo.</p> | |

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| <p>Slide 98</p>  <p>The slide is titled "Tom's Story: Setting up the Christmas Tree (Continued)". It features two silhouetted figures, a man and a woman, facing each other. A speech bubble from the woman says: "Tom, so you'll buy a large Christmas tree and start setting up the star and lights along with the tree? I think we're going to need an extension cord for the lights as well." The slide includes the Brighter Blue logo in the top right corner and the IBM logo at the bottom right.</p> | |

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| <p>Slide 99</p>  <p>The slide is titled "Tom's Story: Setting up the Christmas Tree (Continued)". It features two silhouettes of people facing each other. A red speech bubble from the left figure contains the text "Sure. Will do.". The slide includes the Brighter Blue logo in the top right corner and the IBM logo at the bottom right. The footer contains the text "100 Basic Testing © Copyright IBM Corporation 2015".</p> | |

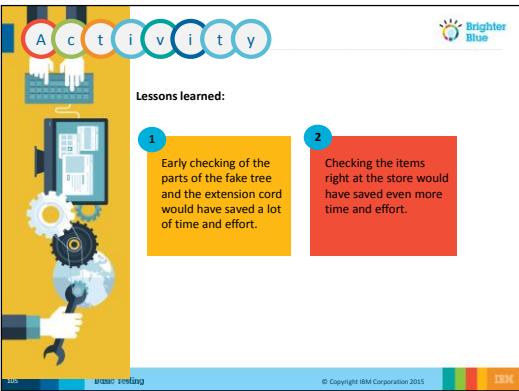
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| <p>Slide 100</p>  <p>The slide is titled "Tom's Story: Setting up the Christmas Tree (Continued)". It features two silhouettes of people facing each other. A speech bubble from the right person says: "Once done with my shopping, I'll help you finish the decorations before evening. The kids will be delighted to see it when they're back home!" The slide includes the Brighter Blue logo in the top right corner and the IBM logo at the bottom right.</p> | |

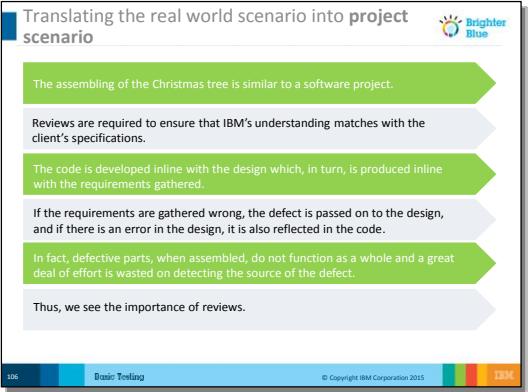
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| <p>Slide 101</p>  <p>The slide is titled "Tom's Story: Setting up the Christmas Tree (Continued)". It features two silhouettes of people facing each other. A speech bubble from the left person says "Ok! Sounds like a plan!". The slide includes the Brighter Blue logo in the top right corner and the IBM logo at the bottom right. The footer contains the text "101 Basic Testing © Copyright IBM Corporation 2015".</p> | |

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| <p>Slide 102</p> <div style="border: 1px solid black; padding: 10px;"> <p>Tom's Story: Setting up the Christmas Tree (Continued)</p> <p>By evening, Tom has assembled the tree, and is almost done putting up the star and the lights when his wife and kids walk in.</p> <p>They are happy to see the tree, but Pam says "I really wanted to see a golden star and not a silver star".</p> <p>Tom then switches on the lights but they are not working. Since the lights are already on the tree, he gets a ladder and checks them one by one to make sure they are ok. He then finally has to remove the extension cord to check it, and he realizes there is a problem with the extension cord.</p> <p>Pam tries to place a gift near the base of the tree when she notices a crack on the stand at the base of the tree that is holding it up. No sooner than she points it out that</p>  </div> | |

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| <p>Slide 103</p>  <p>The slide features a yellow background with a central illustration of a computer monitor displaying a globe and gears. A hand is shown interacting with the screen. The word "Activity" is written in a decorative font at the top. Below the illustration, the text "What were the lessons learned?" is displayed. The slide is branded with the "Brighter Blue" logo in the top right corner and includes the IBM logo at the bottom right.</p> <p>So what were the lessons learned?</p> <p>Lessons:</p> <ul style="list-style-type: none">Had Tom checked the parts of the fake tree before assembling it and also the extension cord before connecting it, it would have saved him a lot of time and effort. Even then, he would still have to travel all the way back to the store to get it replaced (wasted time).Had Tom checked the parts of the fake tree, the lights, and the extension cord right at the store, he would have saved even more time and effort. | |

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| <p>Slide 104</p>  <p>The slide features a yellow sidebar on the left with the word "Activity" in a circular pattern. The main content area has a white background with a blue header bar at the top. The header bar contains the "Brighter Blue" logo and the text "Lessons learned:". Below this, there are two numbered items:</p> <ol style="list-style-type: none">1 Early checking of the parts of the fake tree and the extension cord would have saved a lot of time and effort.2 Checking the items right at the store would have saved even more time and effort. <p>At the bottom of the slide, there is a footer bar with the text "IBM" and "© Copyright IBM Corporation 2015".</p> | |

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| <p>Slide 105</p> <div style="border: 1px solid black; padding: 10px;"> <p>Translating the real world scenario into project scenario</p>  <ul style="list-style-type: none"> The assembling of the Christmas tree is similar to a software project. Pam giving directions to Tom is similar to a client specifying his requirements to IBM. Pam is unhappy that Tom bought a silver star instead of a gold one. Similarly, when clients specify requirements, reviews are required to ensure that IBM's understanding matches with the client's specifications. The different tree parts, lights, and extension cord are similar to different blocks of code that developers might produce. The code is developed in line with the design which in turn is produced in line with the requirements gathered. </div> | |

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| <ul style="list-style-type: none">▪ If the requirements are gathered wrong, the defect is passed on to the design, and if there is an error in the design, it is also reflected in the code. So when the code is tested, desired results are not achieved.▪ In fact, defective parts, when assembled, do not function as a whole, and a great deal of effort is wasted on detecting the source of the defect, that is, is it a defect in the code or a defect in the design or a defect in the requirements gathered?▪ Thus, we see the importance of reviews and also the importance of detecting errors as soon as they are made. | |

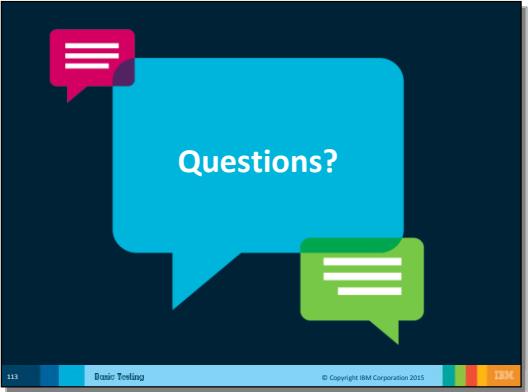
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| <p>Slide 106</p> <div data-bbox="394 421 925 812"><p>The Delhi Metro Mishap</p><ul style="list-style-type: none">▪ Lack of proper inspection caused a major mishap at Delhi Metro rail site. The committee found out that there was a deficiency in the design of the cantilever arm and that the concrete did not have adequate strength due to lack of its adequate curing.▪ Six persons were killed when an under-construction over-bridge of Delhi Metro collapsed in Zamarudpur area of South Delhi.<p>107 Basic Testing © Copyright IBM Corporation 2015 IBM</p></div> | |

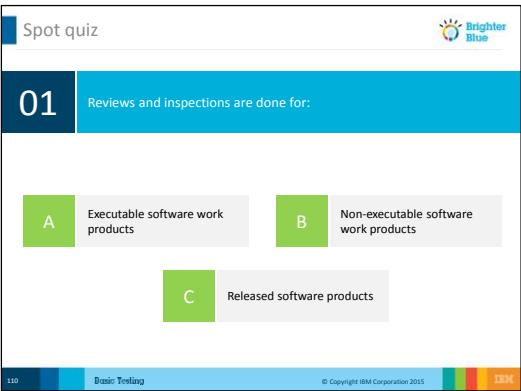
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| <p>Slide 107</p>  <ul style="list-style-type: none"> ▪ The main reason of such accidents is lack of supervision, which leads to poor quality construction. ▪ There are certain operating procedures which have to be followed at every step of construction and inspection. As these types of projects depend upon team work, it is the moral duty of everyone, either director or laborer, to not compromise on the quality and bypass inspection process. ▪ Since Gammon and DMRC had bypassed certain checks and inspection processes, this disaster occurred. | |

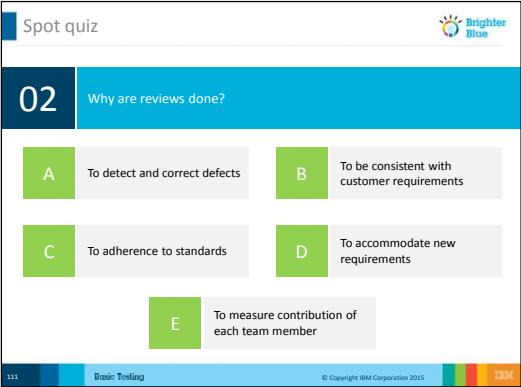
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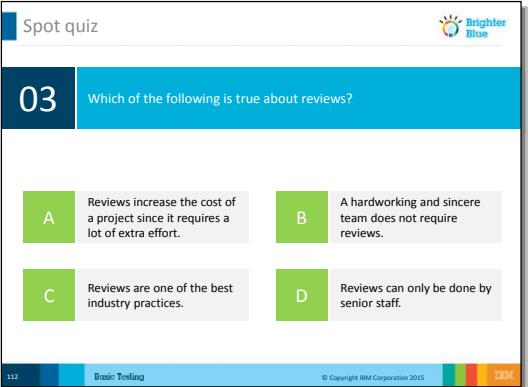
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| <p>Slide 108</p> <div style="border: 1px solid black; padding: 10px;"> <p>Myths about Reviews and Inspections (continued) </p> <p>Myths versus realities:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #80D0A0;">Myth</th> <th style="background-color: #80D0A0;">Reality</th> </tr> </thead> <tbody> <tr> <td>Reviews and inspections require a lot of extra effort, and thus increase the cost of a project.</td> <td>If reviews are done in a timely manner and by members who are well-versed with the product being reviewed, it requires minimal effort.</td> </tr> <tr> <td>Hard work alone results in quality. Everyone always tries to produce high quality.</td> <td>Even if everyone genuinely works hard to produce high quality products, manual error is always possible.</td> </tr> <tr> <td>Reviews and inspections can be done only by senior staff.</td> <td>Anyone who is well-versed about the product being reviewed can do the reviews.</td> </tr> </tbody> </table> <p style="text-align: center; font-size: small; margin-top: 10px;"> 108 Basic Testing © Copyright IBM Corporation 2015  </p> </div> <p>Reality:</p> <ul style="list-style-type: none"> ▪ If reviews are done in a timely manner and by members who are well-versed with the product being reviewed, it requires minimal effort. No reviews result in defects and rework taking even more time and effort to make fixes. ▪ Even if everyone genuinely works hard to produce high quality products, manual error is always possible. Also, it is easy to miss defects when we continuously look at the same piece of code. A peer might be able to catch it easily. ▪ Anyone who is well-versed about the product being reviewed can do the reviews. | Myth | Reality | Reviews and inspections require a lot of extra effort, and thus increase the cost of a project. | If reviews are done in a timely manner and by members who are well-versed with the product being reviewed, it requires minimal effort. | Hard work alone results in quality. Everyone always tries to produce high quality. | Even if everyone genuinely works hard to produce high quality products, manual error is always possible. | Reviews and inspections can be done only by senior staff. | Anyone who is well-versed about the product being reviewed can do the reviews. | |
| Myth | Reality | | | | | | | | |
| Reviews and inspections require a lot of extra effort, and thus increase the cost of a project. | If reviews are done in a timely manner and by members who are well-versed with the product being reviewed, it requires minimal effort. | | | | | | | | |
| Hard work alone results in quality. Everyone always tries to produce high quality. | Even if everyone genuinely works hard to produce high quality products, manual error is always possible. | | | | | | | | |
| Reviews and inspections can be done only by senior staff. | Anyone who is well-versed about the product being reviewed can do the reviews. | | | | | | | | |

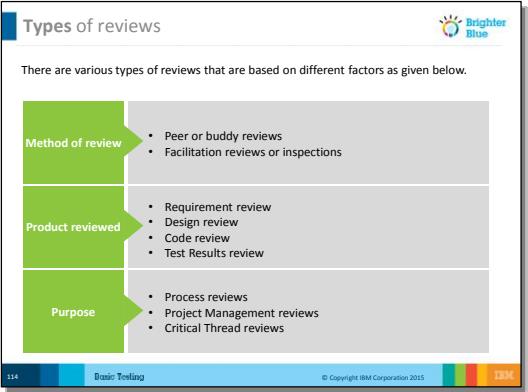
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| <p>Slide 109</p>  <p>A dark blue slide with a large light blue speech bubble in the center containing the text "Questions?". There are two smaller speech bubbles, one pink on the left and one green on the right, each with three horizontal lines inside. At the bottom, there is a navigation bar with icons for back, forward, and search, followed by the text "Basic Testing" and "© Copyright IBM Corporation 2015".</p> | |

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| <p>Slide 110</p>  <p>The slide is titled "Spot quiz" and shows a question numbered 01. The question asks: "Reviews and inspections are done for:". Three options are listed: A) Executable software work products, B) Non-executable software work products, and C) Released software products. The slide footer includes the number 110, the title "Basic Testing", and the IBM logo.</p> | |

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| <p>Slide 111</p>  <p>A screenshot of a 'Spot quiz' slide titled '02 Why are reviews done?'. It lists five options (A-E) in green boxes:</p> <ul style="list-style-type: none">A To detect and correct defectsB To be consistent with customer requirementsC To adherence to standardsD To accommodate new requirementsE To measure contribution of each team member <p>The slide footer includes '111 Basic Testing © Copyright IBM Corporation 2015' and the IBM logo.</p> | |

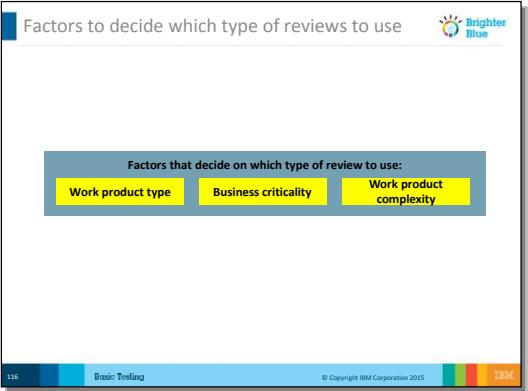
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| <p>Slide 111</p>  <p>A screenshot of a 'Spot quiz' slide titled '03 Which of the following is true about reviews?'. It contains four options labeled A, B, C, and D, each with a green square icon. Option A: 'Reviews increase the cost of a project since it requires a lot of extra effort.' Option B: 'A hardworking and sincere team does not require reviews.' Option C: 'Reviews are one of the best industry practices.' Option D: 'Reviews can only be done by senior staff.' The slide footer includes '111 Basic Testing © Copyright IBM Corporation 2015' and the IBM logo.</p> | |

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| <p>Slide 113</p>  <p>The slide is titled "Types of reviews". It contains a grid with three columns: "Method of review", "Product reviewed", and "Purpose".</p> <ul style="list-style-type: none"> Method of review: <ul style="list-style-type: none"> Peer or buddy reviews Facilitation reviews or inspections Product reviewed: <ul style="list-style-type: none"> Requirement review Design review Code review Test Results review Purpose: <ul style="list-style-type: none"> Process reviews Project Management reviews Critical Thread reviews <p>There are many types of reviews based on different factors. A few are mentioned here:</p> <p>Based on method of review:</p> <ul style="list-style-type: none"> • Peer or buddy reviews • Facilitation reviews or inspections <p>Based on product reviewed:</p> <ul style="list-style-type: none"> • Requirement review • Design review | |

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| <ul style="list-style-type: none">• Code review• Test Results review <p>Based on purpose:</p> <ul style="list-style-type: none">• Process reviews (to check compliance to organization processes)• Project Management Reviews (to review project health and check risks)• Critical Thread Reviews (meetings to discuss and review topics on people, process, and performance) | |

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| <p>Slide 114</p>  <p>The diagram compares Peer reviews and Facilitator reviews. It shows two columns: 'Peer reviews' and 'Facilitator reviews'. Under 'Peer reviews', it says: 'Informal review to confirm the understanding of the producer and check for correctness of product' and 'One or more peer members perform the review either jointly or independently'. Under 'Facilitator reviews', it says: 'Formal review to verify that the artifact complies with the standard of excellence' and '5-10 participants in the review that is led by a review leader'. The diagram is from page 115 of Basic Testing, IBM Corporation 2015.</p> <ul style="list-style-type: none"> ▪ Peer reviews <ul style="list-style-type: none"> ○ Peer or buddy reviews (walkthroughs) are informal reviews used to confirm the understanding of the producer and check for correctness of product being reviewed. ○ One or more peer members (with expertise in the subject of the product to be reviewed) perform the review either jointly or independently. ▪ Facilitator Reviews | |

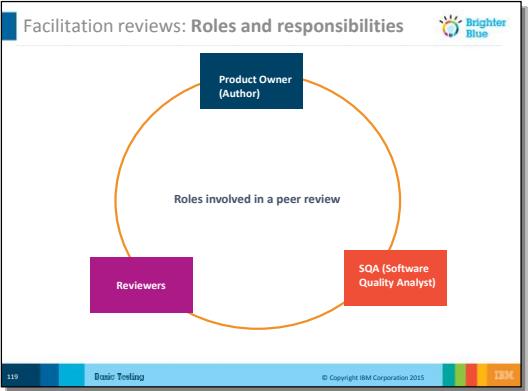
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| <ul style="list-style-type: none">○ Facilitator reviews (inspection) are formal reviews used to verify that the artifact compiles with the standard of excellence.○ A team of not less than 5 percent and not more than 10 (each with specific defined roles) participates in the review that is led by a review leader. | |

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| <p>Slide 115</p>  <p>Work product type - Design document, code, or any other</p> | |

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| <p>Slide 116</p> <div style="border: 1px solid black; padding: 10px;"> <p>Peer reviews: Characteristics</p>  <p>This slide contains three bullet points under the heading "Peer reviews: Characteristics".</p> <ul style="list-style-type: none"> This is a less formal verification technique. It is the author who initiates the session. There may be several peer reviews in each software development lifecycle activity. <p>At the bottom of the slide, there is a navigation bar with icons for back, forward, and search, along with the text "117 Basic Testing © Copyright IBM Corporation 2015 IBM".</p> </div> <p>Peer reviews:</p> <ul style="list-style-type: none"> This is a less formal verification technique - This is a less formal verification technique in which a technical peer analyzes or improves the quality of the original work product, for example, by finding defects or proposing a more optimal solution. It is the author who initiates the session - Since peer reviews cater to the needs of the producer or author of the software artifact (in acquiring superior knowledge of all aspects of it), it is the author who initiates the session. | |

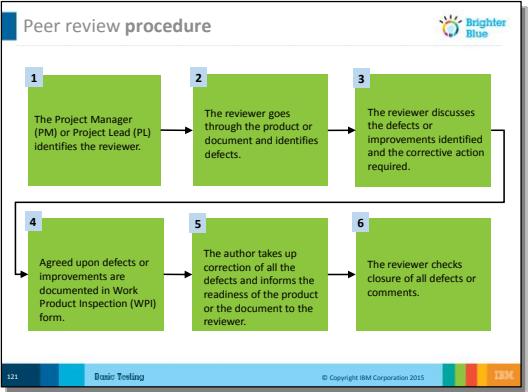
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| <ul style="list-style-type: none">▪ There may be several peer reviews in each software development life cycle activity - There may be several peer reviews in each software development life cycle activity and they yield open issues and action items. While these issues and action items may be tracked to closure, the only measurement taken from these reviews is a count of the number of peer reviews held along with effort spent and process improvements identified. | |

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| <p>Slide 117</p>  <p>The slide has a blue header bar with the title 'Expected end results of peer reviews'. Below the title is the Brighter Blue logo. The main content area is divided into two colored boxes: a green box on the left and a purple box on the right. The green box contains the text: 'Participants - reviewer(s) and author - agree on the approaches taken, product, and engineering practices applied.' The purple box contains the text: 'Completeness and correctness of capabilities and features of the reviewed product are obtained.' At the bottom of the slide, there is a navigation bar with icons for back, forward, and search, along with the text '118 Basic Testing © Copyright IBM Corporation 2015'.</p> | |

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| <p>Slide 118</p>  <p>The diagram illustrates the roles involved in a peer review. It features three colored boxes: a dark blue box at the top labeled "Product Owner (Author)", a purple box on the left labeled "Reviewers", and a red box on the right labeled "SQA (Software Quality Analyst)". Orange curved arrows connect the "Product Owner (Author)" box to the "Reviewers" box, and the "Reviewers" box to the "SQA (Software Quality Analyst)" box, forming a cycle. The background of the slide is white, and there is a navigation bar at the bottom.</p> | |

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| <p>Slide 119</p>  <p>Product Owner (Author):</p> <ul style="list-style-type: none"> ▪ Initiates and schedules reviews ▪ Ensures adherence to review process ▪ Identifies reviewers and distributes the product ▪ Ensures rework is carried out ▪ Fills in quality records <p>Reviewers:</p> <ul style="list-style-type: none"> ▪ Documents the review findings and completes the 'Review Summary Report' ▪ Reviews the product ▪ Can also approve the product <p>SQA (Software Quality Analyst):</p> <ul style="list-style-type: none"> ▪ Reviews the product and communicates the comments to the review leader ▪ Tracks the rework and resolution list to closure ▪ Signs off the review summary report <p>Product Owner (Author):</p> <ul style="list-style-type: none"> ▪ Initiating the review process and scheduling reviews ▪ Ensuring the review process is adhered to ▪ Identifying reviewers and distributing the product for review. The owner may seek help from his manager in identification. ▪ Ensuring any rework as a result of the review is carried out ▪ Filing the quality records that are generated during the review process as objective evidence of having carried out the review <p>Reviewers:</p> | |

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| <ul style="list-style-type: none">▪ Documenting the review findings and completing the 'Review Summary Report'▪ Reviewing the product▪ Can also approve the product <p>SQA (Software Quality Analyst):</p> <ul style="list-style-type: none">▪ Where applicable, reviewing the product and communicating the comments to the review leader▪ Where applicable, tracking the rework and resolution list to closure▪ Signing off the review summary report after ensuring the defect / resolutions list is closed and the summary report is complete | |

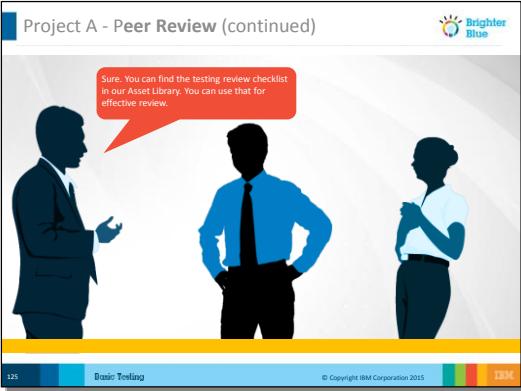
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| <p>Slide 120</p>  <pre> graph LR 1[1 The Project Manager (PM) or Project Lead (PL) identifies the reviewer.] --> 2[2 The reviewer goes through the product or document and identifies defects.] 2 --> 3[3 The reviewer discusses the defects or improvements identified and the corrective action required.] 3 --> 4[4 Agreed upon defects or improvements are documented in Work Product Inspection (WPI) form.] 4 --> 5[5 The author takes up correction of all the defects and informs the readiness of the product or the document to the reviewer.] 5 --> 6[6 The reviewer checks closure of all defects or comments.] </pre> <ul style="list-style-type: none"> The Project Manager (PM) or Project Lead (PL) identifies the reviewer based on the size, complexity, and importance of the product or document to be reviewed. The reviewer goes through the product or document and identifies defects based on appropriate checklists or specifications or standards. The reviewer discusses the defects or improvements identified, the corrective action required, and provides clarifications if any. Once the defects or improvements are agreed upon, they are documented in the Work Product Inspection (WPI) form. It is the | |

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| <p>responsibility of the PM or PL to ensure that the reviews are conducted, results documented, and the defect corrections are carried out.</p> <ul style="list-style-type: none">•The author takes up the correction of all the defects identified to be corrected and informs the readiness of the product or the document to the reviewer.•If re-review is required, another iteration of review is done, but if the review result requires only verification of the closure of defects or comments, the reviewer checks whether all defects have been closed. | |

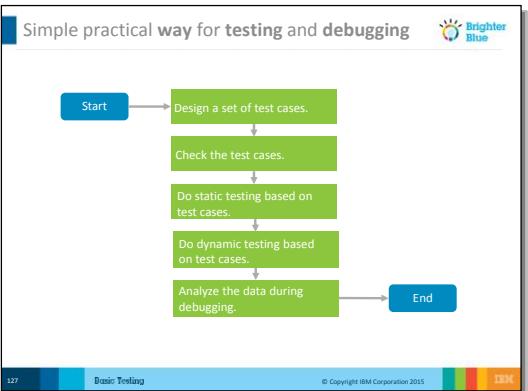
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| <p>Slide 121</p>  <p>The slide content is a screenshot of a presentation slide titled "Project A - Peer Review". It features three silhouettes of people standing side-by-side. The person on the left is a man in a suit, the middle is a man in a blue shirt and tie, and the person on the right is a woman in a white blouse and dark pants. Below the silhouettes is a yellow text box containing the following text: "John is a Project Lead handling Project A. Lisa and Tom are working on modules 1 and 2 respectively, and have just completed the testing of their modules." At the bottom of the slide, there is a navigation bar with the number "121", the text "Basic Testing", and the IBM logo.</p> | |

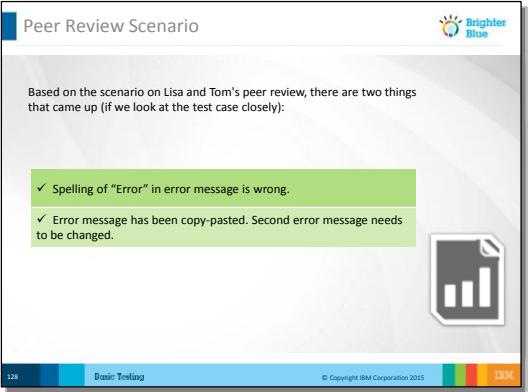
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| <p>Slide 122</p>  <p>The slide is titled "Project A - Peer Review (continued)". It features three silhouetted figures: a man in a suit, a man in a blue shirt and tie, and a woman in a business suit. A speech bubble from the man in the blue shirt says: "Hi Lisa and Tom. Now that you have completed testing your modules, you can peer review each test cases. As peers who have worked on the project design, both of you are aware of the functionality of both the modules. Hence, the reviews will be effective." The slide has a navigation bar at the bottom with icons for back, forward, and search.</p> | |

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| <p>Slide 123</p>  <p>The slide is titled "Project A - Peer Review (continued)". It features three stylized human figures: a man in a dark suit, a man in a blue shirt and tie, and a woman in a white blouse and dark pants. They are standing in a row, facing each other in a discussion. A red speech bubble from the central figure contains the text: "Sure John. I have not done such reviews earlier. Are there any guidelines that can help me to do the review better?" The slide has a yellow footer bar with the number 124, the text "Basic Testing", and the IBM logo.</p> | |

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| <p>Slide 124</p>  <p>The slide is titled "Project A - Peer Review (continued)". It features three stylized human figures: a man in a dark suit, a man in a light blue shirt and tie, and a woman in a white blouse and dark pants. A speech bubble from the man in the light blue shirt says: "Sure. You can find the testing review checklist in our Asset Library. You can use that for effective review." The slide includes the Brighter Blue logo in the top right corner and the IBM logo at the bottom right. The footer contains the number 125, the title "Basic Testing", and copyright information: "© Copyright IBM Corporation 2015".</p> | |

| Slide Content | Use this space for your notes |
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| <p>Slide 125</p>  <p>The slide is titled "Project A - Peer Review (continued)". It features three stylized human figures: a man in a dark suit, a man in a light blue shirt and tie, and a woman in a white blouse and dark pants. A speech bubble from the man in the blue shirt says: "Ok John. We will peer review each others test case designs and also ensure that defects, if any, are closed." The slide has a yellow footer bar with the number 125, the text "Basic Testing", and the IBM logo.</p> | |

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| <p>Slide 126</p>  <pre>graph TD; Start([Start]) --> Design[Design a set of test cases]; Design --> Check[Check the test cases]; Check --> Static[Do static testing based on test cases.]; Static --> Dynamic[Do dynamic testing based on test cases.]; Dynamic --> Analyze[Analyze the data during debugging.]; Analyze --> End([End]);</pre> <p>The flowchart illustrates a simple practical way for testing and debugging. It begins with a 'Start' node, followed by a sequence of steps: 'Design a set of test cases', 'Check the test cases', 'Do static testing based on test cases.', 'Do dynamic testing based on test cases.', and finally 'Analyze the data during debugging.' The process concludes at an 'End' node. The entire slide is branded with the Brighter Blue logo.</p> | |

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| <p>Slide 127</p>  <p>Based on the scenario on Lisa and Tom's peer review, there are two things that came up (if we look at the code closely):</p> <ul style="list-style-type: none"> Spelling of 'Error' in error message is wrong. Error message has been copy-pasted. Second error message needs to be changed. | |

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| <p>Slide 128</p> <div data-bbox="397 421 910 816"><p>Review of Test cases example</p><p>A tester has to test for a function as :-</p><p>Function to send order by Email</p><ul style="list-style-type: none">▪ Fields▪ Email ID▪ Recipients name▪ Click Button▪ Send<p>Test Case</p><ul style="list-style-type: none">▪ Enter the Email ID of person▪ Enter the recipient name▪ Click on Submit button<p>Basic Testing © Copyright IBM Corporation 2015 IBM</p></div> | |

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|---|---|--------|--------------|-----------|-------------------|--|---------------------|----|---------------|-------------------------|------------------|--|-----------|--|-----------------|-------------------|---------------|---|--------|---|---------|--|------------|--|------------------|--|-------------|---|-------------------|------------------------------------|------------------|---|--|
| <p>Slide 129</p> <div style="border: 1px solid black; padding: 10px;"> <p>Review of Test cases example (continued)</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Test Suite ID</td> <td>TC001.</td> </tr> <tr> <td>Test Case ID</td> <td>TCHome_01</td> </tr> <tr> <td>Test Case Summary</td> <td>To send a email to recipient on the order placed</td> </tr> <tr> <td>Related Requirement</td> <td>NA</td> </tr> <tr> <td>Prerequisites</td> <td>Order should be placed.</td> </tr> <tr> <td>Steps to execute</td> <td>Enter Email id , Enter recipient name , click Submit</td> </tr> <tr> <td>Test Data</td> <td>The test data, or links to the test data, that are to be used while conducting the test.</td> </tr> <tr> <td>Expected Result</td> <td>The email is sent</td> </tr> <tr> <td>Actual Result</td> <td>The actual result of the test; to be filled after executing the test.</td> </tr> <tr> <td>Status</td> <td>Pass or Fail. Other statuses can be 'Not Executed' if testing is not performed and 'Blocked' if testing is blocked.</td> </tr> <tr> <td>Remarks</td> <td>Any comments on the test case or test execution.</td> </tr> <tr> <td>Created By</td> <td>The name of the author of the test case.</td> </tr> <tr> <td>Date of Creation</td> <td>The date of creation of the test case.</td> </tr> <tr> <td>Executed By</td> <td>The name of the person who executed the test.</td> </tr> <tr> <td>Date of Execution</td> <td>The date of execution of the test.</td> </tr> <tr> <td>Test Environment</td> <td>The environment (Hardware/Software/Network) in which the test was execute</td> </tr> </table> <p style="text-align: center; margin-top: 10px;"> 10 Basic Testing © Copyright IBM Corporation 2015 IBM </p> </div> | Test Suite ID | TC001. | Test Case ID | TCHome_01 | Test Case Summary | To send a email to recipient on the order placed | Related Requirement | NA | Prerequisites | Order should be placed. | Steps to execute | Enter Email id , Enter recipient name , click Submit | Test Data | The test data, or links to the test data, that are to be used while conducting the test. | Expected Result | The email is sent | Actual Result | The actual result of the test; to be filled after executing the test. | Status | Pass or Fail. Other statuses can be 'Not Executed' if testing is not performed and 'Blocked' if testing is blocked. | Remarks | Any comments on the test case or test execution. | Created By | The name of the author of the test case. | Date of Creation | The date of creation of the test case. | Executed By | The name of the person who executed the test. | Date of Execution | The date of execution of the test. | Test Environment | The environment (Hardware/Software/Network) in which the test was execute | |
| Test Suite ID | TC001. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Test Case ID | TCHome_01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Test Case Summary | To send a email to recipient on the order placed | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Related Requirement | NA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prerequisites | Order should be placed. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Steps to execute | Enter Email id , Enter recipient name , click Submit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Test Data | The test data, or links to the test data, that are to be used while conducting the test. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Expected Result | The email is sent | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Actual Result | The actual result of the test; to be filled after executing the test. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Status | Pass or Fail. Other statuses can be 'Not Executed' if testing is not performed and 'Blocked' if testing is blocked. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Remarks | Any comments on the test case or test execution. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Created By | The name of the author of the test case. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Date of Creation | The date of creation of the test case. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Executed By | The name of the person who executed the test. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Date of Execution | The date of execution of the test. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Test Environment | The environment (Hardware/Software/Network) in which the test was execute | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| <p>Slide 130</p> <div data-bbox="394 421 918 816"><p>Review comments</p><p>Spelling Recipient is not correct in the test case summary and steps to test. Expected result should always be having "Should " added – like –"Email should be sent to recipient."</p><p>131 Basic Testing © Copyright IBM Corporation 2015 IBM</p></div> | |

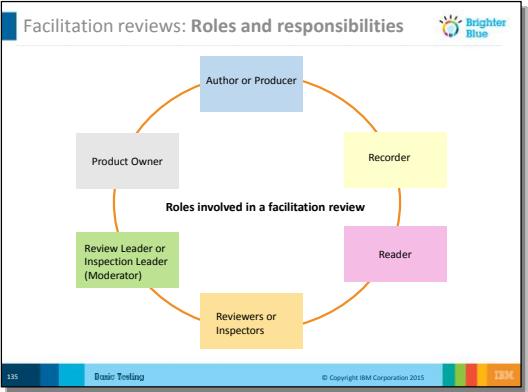
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| <p>Slide 131</p>  <ul style="list-style-type: none"> ■ Facilitation Reviews or Inspections (also called Fagan's Review) are the most rigorous form of reviews which involve structured formal reviews done by a group of technical personnel who analyze or improve the quality of the original work product as well as the quality of the method. ■ In a lifecycle activity, the software inspection is the exit criteria or gate that concludes the activity. | |

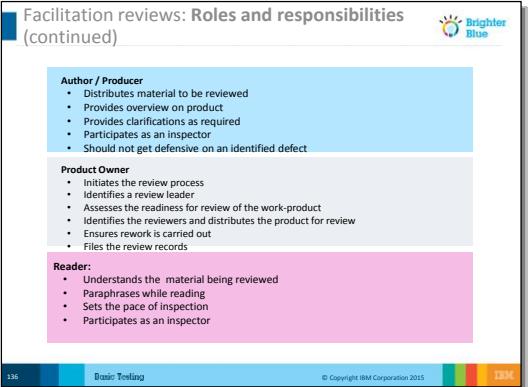
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| <p>Slide 132</p>  <pre> graph TD A[Facilitation review characteristics] --- B[Done by technical people for technical people] A --- C[Consists of structured, well-defined processes with well-defined roles] A --- D[Reviewers prepared in advance; clarifications obtained before the meeting] A --- E[Review data recorded and used for monitoring effectiveness of the review procedure] A --- F[Focus on identifying problems and not resolving them] </pre> <p>Characteristics of Facilitation reviews</p> <ul style="list-style-type: none"> • They are done by technical people for technical people. • They consist of structured, well defined processes with well-defined roles for participants. • Reviewers are prepared in advance, and clarifications are obtained before the meeting. • Focus is on identifying problems and not resolving them. • Review data from these reviews is recorded and used for monitoring effectiveness of the review procedure. | |

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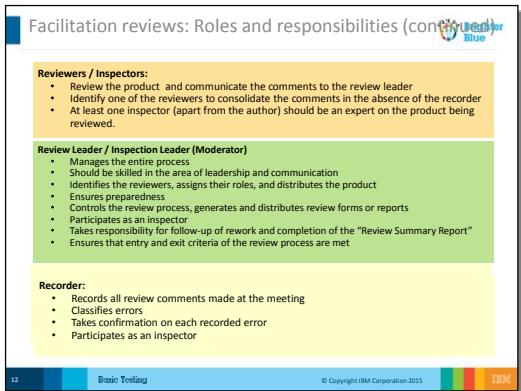
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| <p>Slide 133</p> <div data-bbox="394 421 918 812"><p>Fagan's Inspection / Review</p><p>A Fagan inspection is a structured process of trying to find defects in development /Testing documents such as programming code, specifications, designs ,Testing and others during various phases of the software development process. It is named after Michael Fagan who is credited with being the inventor of formal software inspections.</p><p>Examples of activities for which Fagan Inspection can be used are:</p><ul style="list-style-type: none">▪ Requirement specification▪ Software/Information System architecture (for example DYA)▪ Programming (for example for iterations in XP or DSOM)▪ Software testing (for example when creating test scripts)<p>11 Basic Testing © Copyright IBM Corporation 2015 IBM</p></div> | |

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| <p>Slide 134</p>  <p>The diagram is titled "Facilitation reviews: Roles and responsibilities". It shows six roles involved in a facilitation review, each represented by a colored box with an orange arrow pointing to it from a label below:</p> <ul style="list-style-type: none">Author or Producer (blue)Recorder (yellow)Reader (pink)Reviewers or Inspectors (orange)Product Owner (grey)Review Leader or Inspection Leader (Moderator) (green) <p>At the bottom of the slide, there is a navigation bar with the number 135, the text "Basic Testing", and the IBM logo.</p> | |

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| <p>Slide 135</p>  <p>The slide is titled "Facilitation reviews: Roles and responsibilities (continued)". It contains three sections: "Author / Producer", "Product Owner", and "Reader".</p> <ul style="list-style-type: none"> Author / Producer: <ul style="list-style-type: none"> Distributes material to be reviewed Provides overview on product Provides clarifications as required Participates as an inspector Should not get defensive on an identified defect Product Owner: <ul style="list-style-type: none"> Initiates the review process Identifies a review leader Assesses the readiness for review of the work-product Identifies the reviewers and distributes the product for review Ensures rework is carried out Files the review records Reader: <ul style="list-style-type: none"> Understands the material being reviewed Paraphrases while reading Sets the pace of inspection Participates as an inspector <p>At the bottom, there is a navigation bar with icons for back, forward, search, and other presentation controls.</p> <p>Author / Producer:</p> <ul style="list-style-type: none"> Distributes material to be reviewed Provides overview on product Provides clarifications as required Participates as an inspector Should not get defensive on an identified defect <p>Product Owner:</p> <ul style="list-style-type: none"> Initiates the review process Identifies a review leader; may seek help from his manager in identifying a review leader | |

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| <ul style="list-style-type: none"> • Assesses the readiness for review of the work-product along with the review leader • Identifies the reviewers and distributes the product for review along with the review leader • Ensures that any rework as a result of the review is carried out • Files the review records that are generated during the review process as objective evidence of having carried out the review • Review Leader / Inspection Leader (Moderator): <ul style="list-style-type: none"> • Manages the entire process and ensures that the review process is adhered to • Should be skilled in the area of leadership and communication, and be impartial • Identifies the reviewers and assigns their roles, distributes the product and related documents • Ensures preparedness before the review • Controls the pace of review meetings, moderates the review, and also generates and distributes review forms or reports • Participates as an inspector • Takes responsibility for follow-up of rework and completion of the 'Review Summary Report' • Ensures that entry and exit criteria of the review process are met | |

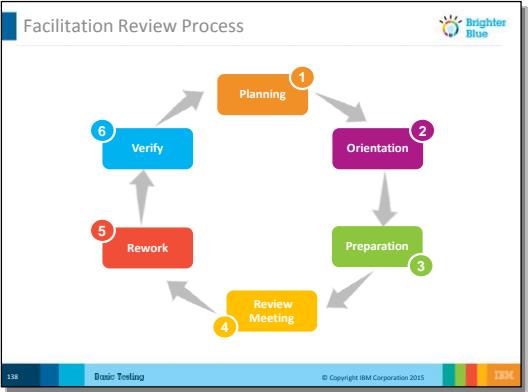
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| <p>Slide 136</p>  <p>Reviewers / Inspectors:</p> <ul style="list-style-type: none"> Review the product and communicate the comments to the review leader Identify one of the reviewers to consolidate the comments in the absence of the recorder At least one inspector (apart from the author) should be an expert on the product being reviewed. <p>Review Leader / Inspection Leader (Moderator)</p> <ul style="list-style-type: none"> Manages the entire process Should be able to have area of leadership and communication Identifies the reviewers, assigns their roles, and distributes the product Ensures preparedness Controls the review process, generates and distributes review forms or reports Participates as an inspector Takes responsibility for follow-up of rework and completion of the "Review Summary Report" Ensures that entry and exit criteria of the review process are met <p>Recorder:</p> <ul style="list-style-type: none"> Records all review comments made at the meeting Classifies errors Takes confirmation on each recorded error Participates as an inspector <p>12 Basic Testing © Copyright IBM Corporation 2015</p> | |

Reviewers / Inspectors:

- **Review the product and communicate the comments to the review leader in the review meeting. This involves:**
 - **Preparing for the inspection meeting**
 - **Understanding the product**
 - **Doing the inspection**
 - **Focusing on product and NOT the producer**

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| <ul style="list-style-type: none"> ■ In the absence of the recorder, the review leader is responsible for identifying one of the reviewers to consolidate the comments. ■ Everybody involved in the facilitation review (leader, reader, recorded, and author) is an inspector, but it is important that at least one inspector (apart from the author) should be an expert on the product being reviewed. <p>Reader:</p> <ul style="list-style-type: none"> ■ Understands the material being reviewed ■ Paraphrases while reading ■ Sets the pace of inspection ■ Participates as an inspector <p>Recorder:</p> <ul style="list-style-type: none"> ■ Records all review comments made at the meeting (as indicated by leader) ■ Classifies errors ■ Takes confirmation on each recorded error ■ Participates as an inspector | |

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| <p>Slide 137</p>  <pre> graph TD Planning[Planning 1] --> Orientation[Orientation 2] Orientation --> Preparation[Preparation 3] Preparation --> ReviewMeeting[Review Meeting 4] ReviewMeeting --> Rework[Rework 5] Rework --> Verify[Verify 6] Verify --> Planning </pre> <p>The diagram illustrates the Facilitation Review Process as a cyclical flow of six steps:</p> <ul style="list-style-type: none"> Planning: Choose team, materials, and dates (Step 1) Orientation: Present product, process and goals (Kick-off) (Step 2) Preparation: Check product, and note issues (Step 3) Review Meeting: Consolidate issues (Step 4) Rework: Correct defects (Step 5) Verify: Verify product / process quality (Follow-up) (Step 6) <p>Arrows indicate a clockwise flow between the steps, with a feedback loop from Verify back to Planning.</p> | |

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| <p>Slide 138</p>  <p>Project A - Facilitation Review</p> <p>Mike is the Manager of Project A. John is the Project Leader for the same project and reports to Mike. There are several team members, two of whom are Tom and Lisa. The clients have just specified their requirements to the onsite coordinator Jason. In their weekly meeting, the following discussion ensues:</p> <p>138 Basic Testing © Copyright IBM Corporation 2015 IBM</p> <p>The clients have just specified their requirement to the onsite coordinator, Jason. After which, he went to the site to meet up with the team to discuss it, to ensure that everything as expected is covered and nothing gets missed out.</p> | |

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| <p>Slide 139</p>  <p>Project A - Facilitation Review (continued)</p> <p>Brighter Blue</p> <p>140 Basic Testing © Copyright IBM Corporation 2015 IBM</p> | |

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| <p>Slide 140</p>  <p>Project A - Facilitation Review (continued)</p> <p>That is good. We now need to ensure that they are reviewed and approved by the client. This is a huge project worth \$100 million. Therefore, we need to be sure that we have captured the client requirements accurately.</p> <p>Mike</p> <p>140 Basic Testing © Copyright IBM Corporation 2015 IBM</p> | |

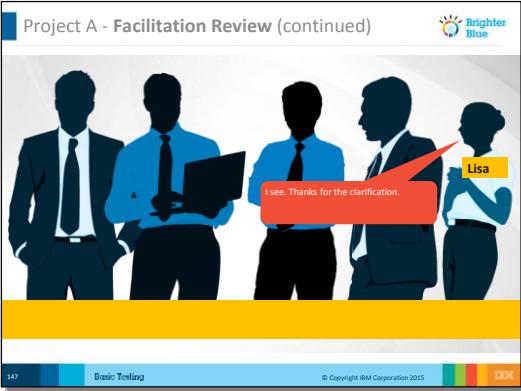
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| <p>Slide 141</p>  | |

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| <p>Slide 142</p>  | |

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| <p>Slide 143</p>  <p>Project A - Facilitation Review (continued)</p> <p>John</p> <p>Sure. I will make arrangements for the review. I will find out the location for the meeting, based on our convenience and also after ensuring that all the reviewers get enough time for preparation. Tom, you can be the recorder and Lisa, you can be the reader.</p> <p>144 Basic Testing © Copyright IBM Corporation 2015 IBM</p> | |

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| <p>Slide 144</p>  <p>The slide is titled "Project A - Facilitation Review (continued)". It features a photograph of five people in business attire. A red speech bubble from a person named Lisa asks, "Sure. But I was just wondering, John, why aren't you just doing a peer review of the requirements document?" The slide has a yellow footer bar with the number 144, the title "Basic Testing", and the IBM logo.</p> | |

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| <p>Slide 145</p>  <p>The slide is titled "Project A - Facilitation Review (continued)". It features a photograph of five people in business attire standing in a row. A red callout bubble from the person on the far left, labeled "John", contains the following text: "Well, it's a huge project Lisa and the stakes are very high. Any issues with the requirements can translate into huge problems and even loss of business. Hence, we cannot take the risk. We will need a formal review with the clients." The slide has a blue header bar with the title and a yellow footer bar containing the number 145, the word "Basic Testing", and the IBM logo.</p> | |

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| <p>Slide 146</p>  <p>The slide is titled "Project A - Facilitation Review (continued)". It features a photograph of five people in professional attire. A red callout bubble with the text "I see. Thanks for the clarification." points to a person on the right. The slide has a yellow bar at the bottom with the number 147, the title "Basic Testing", and the IBM logo.</p> | |

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| <p>Slide 147</p>  | |

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| <p>Slide 148</p>  | |

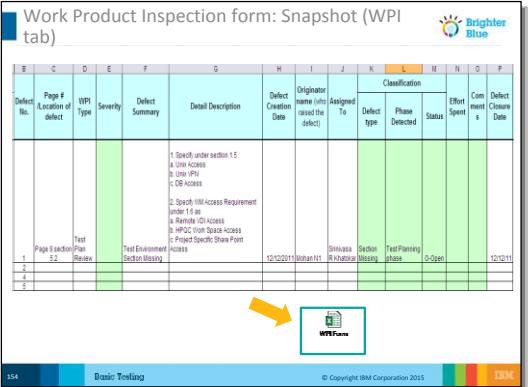
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| <p>Slide 149</p>  <p>Project A - Facilitation Review (continued)</p> <p>Great. So we have a good plan now!</p> <p>Mike</p> <p>150 Basic Testing © Copyright IBM Corporation 2015</p> | |

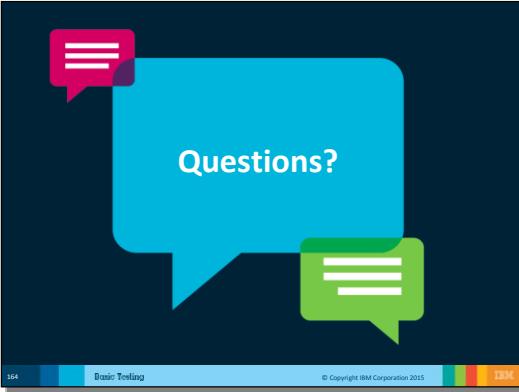
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| <p>Slide 150</p> <div style="border: 1px solid black; padding: 10px;"> <p>Facilitation Review and Peer Review: Comparison </p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #0070C0; color: white;"> <th>Review Characteristics</th> <th>Fagan's Review / Inspection</th> <th>Peer review</th> </tr> </thead> <tbody> <tr> <td>Role of review leader</td> <td>Required</td> <td>Not required</td> </tr> <tr> <td>Role of recorder</td> <td>Required</td> <td>Not required</td> </tr> <tr> <td>Number of reviewers</td> <td>>= 5 and <=10 (including the review leader)</td> <td>>= 1</td> </tr> <tr> <td>Advance distribution of review material (product to be reviewed and related documentation)</td> <td>Required (at least 2 days in advance of review meeting)</td> <td>Required (at least 2 days in advance of when the comments are due)</td> </tr> <tr> <td>Formal review meeting</td> <td>Required</td> <td>Not required</td> </tr> <tr> <td>Review moderation</td> <td>Done by review leader</td> <td>Done by product owner (in case multiple reviewers are used and a meeting is held)</td> </tr> <tr> <td>Consolidation of review comments</td> <td>Done by recorder</td> <td>Done by product owner</td> </tr> </tbody> </table> <p style="font-size: small; margin-top: 10px;"> ESI Basic Testing IBM IBM </p> </div> | Review Characteristics | Fagan's Review / Inspection | Peer review | Role of review leader | Required | Not required | Role of recorder | Required | Not required | Number of reviewers | >= 5 and <=10 (including the review leader) | >= 1 | Advance distribution of review material (product to be reviewed and related documentation) | Required (at least 2 days in advance of review meeting) | Required (at least 2 days in advance of when the comments are due) | Formal review meeting | Required | Not required | Review moderation | Done by review leader | Done by product owner (in case multiple reviewers are used and a meeting is held) | Consolidation of review comments | Done by recorder | Done by product owner | |
| Review Characteristics | Fagan's Review / Inspection | Peer review | | | | | | | | | | | | | | | | | | | | | | | |
| Role of review leader | Required | Not required | | | | | | | | | | | | | | | | | | | | | | | |
| Role of recorder | Required | Not required | | | | | | | | | | | | | | | | | | | | | | | |
| Number of reviewers | >= 5 and <=10 (including the review leader) | >= 1 | | | | | | | | | | | | | | | | | | | | | | | |
| Advance distribution of review material (product to be reviewed and related documentation) | Required (at least 2 days in advance of review meeting) | Required (at least 2 days in advance of when the comments are due) | | | | | | | | | | | | | | | | | | | | | | | |
| Formal review meeting | Required | Not required | | | | | | | | | | | | | | | | | | | | | | | |
| Review moderation | Done by review leader | Done by product owner (in case multiple reviewers are used and a meeting is held) | | | | | | | | | | | | | | | | | | | | | | | |
| Consolidation of review comments | Done by recorder | Done by product owner | | | | | | | | | | | | | | | | | | | | | | | |

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| <p>Slide 151</p> <div style="border: 1px solid black; padding: 10px;"> <p>Facilitation Review and Peer Review: Comparison (continued)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #92D050; color: white;"> <th>Review Characteristics</th> <th>Fagan's Review / Inspection</th> <th>Peer review</th> </tr> </thead> <tbody> <tr> <td>Recording of review comments</td> <td>Review defects / Resolution list must be used. (WPI Form)</td> <td>Not required. (Number of reviews, review effort, and number of process improvements identified are recorded.)</td> </tr> <tr> <td>Review summary report</td> <td>Required, prepared by review leader</td> <td>Required, prepared by product owner</td> </tr> <tr> <td>Evidence of closure of review comments</td> <td>Review leader verifies closure and signs on the review summary report.</td> <td>Product owner completes the review summary report with all details after review closure.</td> </tr> <tr> <td>Capturing review preparation time on review summary report</td> <td>Required</td> <td>Not required</td> </tr> <tr> <td>Capturing review time on review summary report</td> <td>Required</td> <td>Required</td> </tr> </tbody> </table> <p style="text-align: center; font-size: small;">151 Basic Testing © Copyright IBM Corporation 2015 </p> </div> | Review Characteristics | Fagan's Review / Inspection | Peer review | Recording of review comments | Review defects / Resolution list must be used. (WPI Form) | Not required. (Number of reviews, review effort, and number of process improvements identified are recorded.) | Review summary report | Required, prepared by review leader | Required, prepared by product owner | Evidence of closure of review comments | Review leader verifies closure and signs on the review summary report. | Product owner completes the review summary report with all details after review closure. | Capturing review preparation time on review summary report | Required | Not required | Capturing review time on review summary report | Required | Required | |
| Review Characteristics | Fagan's Review / Inspection | Peer review | | | | | | | | | | | | | | | | | |
| Recording of review comments | Review defects / Resolution list must be used. (WPI Form) | Not required. (Number of reviews, review effort, and number of process improvements identified are recorded.) | | | | | | | | | | | | | | | | | |
| Review summary report | Required, prepared by review leader | Required, prepared by product owner | | | | | | | | | | | | | | | | | |
| Evidence of closure of review comments | Review leader verifies closure and signs on the review summary report. | Product owner completes the review summary report with all details after review closure. | | | | | | | | | | | | | | | | | |
| Capturing review preparation time on review summary report | Required | Not required | | | | | | | | | | | | | | | | | |
| Capturing review time on review summary report | Required | Required | | | | | | | | | | | | | | | | | |

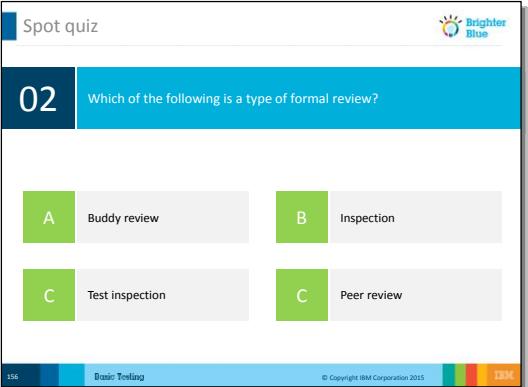
Core Testing>Basic Testing>Day 1

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| <p>Slide 152</p> <div style="border: 1px solid black; padding: 10px;"> <p>Deciding type of review</p> <p></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding-bottom: 5px;">Product</th> <th style="text-align: left; padding-bottom: 5px;">Review Type</th> </tr> </thead> <tbody> <tr> <td colspan="2">Organization Level Plans</td> </tr> <tr> <td>1. First version of all plans (i.e. Process Improvement Plan, Quality Plan, Project Management Plan, Technical Change Management Plan etc.)</td> <td>Fagan's Review</td> </tr> <tr> <td>2. New Processes (i.e. First version of processes)</td> <td>Fagan's Review</td> </tr> <tr> <td>3. Revisions to existing Plans</td> <td>Peer Review</td> </tr> <tr> <td>4. Other</td> <td>Peer Review</td> </tr> <tr> <td colspan="2">Project Level Plans, Documents, Code etc</td> </tr> <tr> <td>1. Project Plans of Complex projects</td> <td>Fagan's Review</td> </tr> <tr> <td>2. Software Requirements (Management Specifications) which require more than 25 person months of effort</td> <td>Fagan's Review</td> </tr> <tr> <td>3. All other documents/Code of Complex & Large projects</td> <td>Fagan's or Peer Review</td> </tr> <tr> <td>4. Project Plan documents and code of short term/Organic standard projects</td> <td>Peer Review</td> </tr> <tr> <td>5. Revised Plan of all projects</td> <td>Peer Review</td> </tr> <tr> <td>6. Revised documents and code of all projects</td> <td>Peer Review</td> </tr> <tr> <td colspan="2">Testing Specific documents/deliverables</td> </tr> <tr> <td>1. Test Strategy/Master Test Plan</td> <td>Fagan's Review</td> </tr> <tr> <td>2. Test Plans</td> <td>Fagan's or Peer Review</td> </tr> <tr> <td>3. Test Specifications /Test Scenarios</td> <td>Fagan's or Peer Review</td> </tr> <tr> <td>4. Test cases/scripts</td> <td>Fagan's or Peer Review</td> </tr> </tbody> </table> <p style="text-align: center; margin-top: 10px;">  Type of review </p> </div> <p>Refer to the Supporting Documents_Day 1 folder for the embedded file.</p> | Product | Review Type | Organization Level Plans | | 1. First version of all plans (i.e. Process Improvement Plan, Quality Plan, Project Management Plan, Technical Change Management Plan etc.) | Fagan's Review | 2. New Processes (i.e. First version of processes) | Fagan's Review | 3. Revisions to existing Plans | Peer Review | 4. Other | Peer Review | Project Level Plans, Documents, Code etc | | 1. Project Plans of Complex projects | Fagan's Review | 2. Software Requirements (Management Specifications) which require more than 25 person months of effort | Fagan's Review | 3. All other documents/Code of Complex & Large projects | Fagan's or Peer Review | 4. Project Plan documents and code of short term/Organic standard projects | Peer Review | 5. Revised Plan of all projects | Peer Review | 6. Revised documents and code of all projects | Peer Review | Testing Specific documents/deliverables | | 1. Test Strategy/Master Test Plan | Fagan's Review | 2. Test Plans | Fagan's or Peer Review | 3. Test Specifications /Test Scenarios | Fagan's or Peer Review | 4. Test cases/scripts | Fagan's or Peer Review | |
| Product | Review Type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Organization Level Plans | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. First version of all plans (i.e. Process Improvement Plan, Quality Plan, Project Management Plan, Technical Change Management Plan etc.) | Fagan's Review | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. New Processes (i.e. First version of processes) | Fagan's Review | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Revisions to existing Plans | Peer Review | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. Other | Peer Review | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Project Level Plans, Documents, Code etc | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Project Plans of Complex projects | Fagan's Review | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 3. All other documents/Code of Complex & Large projects | Fagan's or Peer Review | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. Project Plan documents and code of short term/Organic standard projects | Peer Review | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. Revised Plan of all projects | Peer Review | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. Revised documents and code of all projects | Peer Review | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Testing Specific documents/deliverables | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Test Strategy/Master Test Plan | Fagan's Review | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. Test Plans | Fagan's or Peer Review | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Test Specifications /Test Scenarios | Fagan's or Peer Review | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. Test cases/scripts | Fagan's or Peer Review | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

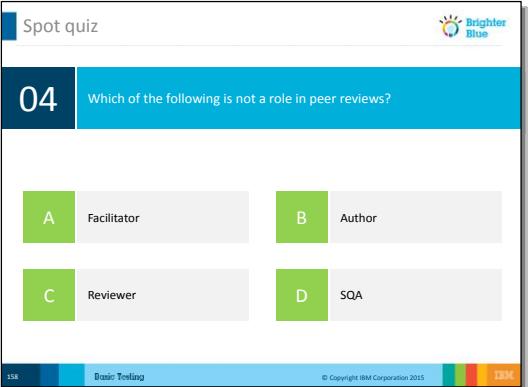
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| <p>Slide 153</p>  <p>Refer to the Supporting Documents_Day 1 folder for the embedded file.</p> | |

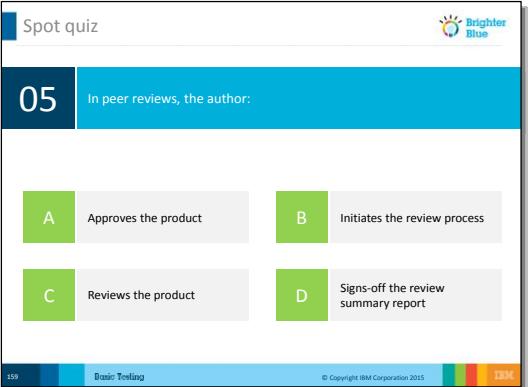
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| <p>Slide 154</p>  <p>A dark blue slide with a large light blue speech bubble in the center containing the text "Questions?". There are two smaller speech bubbles, one pink and one green, positioned above and below the main bubble. At the bottom, there is a navigation bar with icons for back, forward, and search, and the text "154 Basic Testing © Copyright IBM Corporation 2015 IBM".</p> | |

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| <p>Slide 155</p>  <p>A screenshot of a 'Spot quiz' slide titled '01'. The question asks: 'Which of the following is not a type of review?' Below the question are four options: A) Peer review, B) Test inspection, C) Process review, and D) Fagan's inspection. The slide includes a navigation bar at the bottom with icons for back, forward, and search.</p> | |

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| <p>Slide 156</p>  <p>A screenshot of a 'Spot quiz' slide titled 'Slide 156'. The slide number is 02. The question is: 'Which of the following is a type of formal review?'. There are four options: A) Buddy review, B) Inspection, C) Test inspection, and C) Peer review. The correct answer is B) Inspection. The slide footer includes the IBM logo.</p> | |

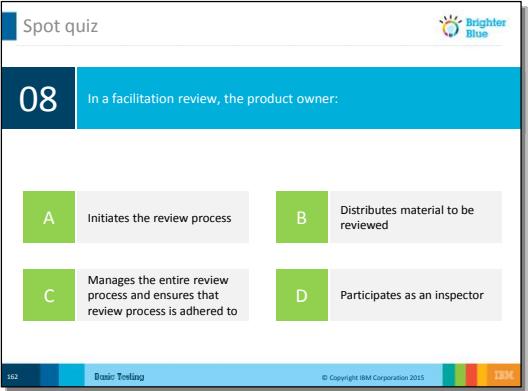
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| <p>Slide 157</p> <div data-bbox="394 421 925 812"><p>Spot quiz</p><p>03 Which of the following does not help to decide the type of review required?</p><p>A Type of work product B Size of work product</p><p>C Business criticality D Complexity of work product</p><p>157 Basic Testing © Copyright IBM Corporation 2015 </p></div> | |

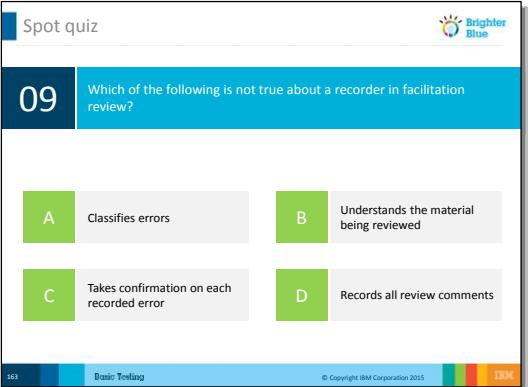
| Slide Content | Use this space for your notes |
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| <p>Slide 158</p>  <p>A screenshot of a 'Spot quiz' slide titled '04'. The question asks: 'Which of the following is not a role in peer reviews?' The options are: A) Facilitator, B) Author, C) Reviewer, and D) SQA. The slide includes the Brighter Blue logo at the top right and the IBM logo at the bottom right.</p> | |

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| <p>Slide 159</p>  <p>A screenshot of a 'Spot quiz' slide titled '05 In peer reviews, the author:'. It lists four options: A) Approves the product, B) Initiates the review process, C) Reviews the product, and D) Signs-off the review summary report. The slide footer includes '159 Basic Testing' and the IBM logo.</p> | |

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| <p>Slide 160</p> <div data-bbox="392 421 918 812"><p>Spot quiz</p><p>06 Which of the following is not true about peer reviews?</p><p>A The review activity takes more than 2 hours.</p><p>B The reviewer identifies defects based on checklists.</p><p>C Defects are documented in the WPI form.</p><p>D The author takes up correction of defects.</p><p>160 Basic Testing © Copyright IBM Corporation 2015 IBM</p></div> | |

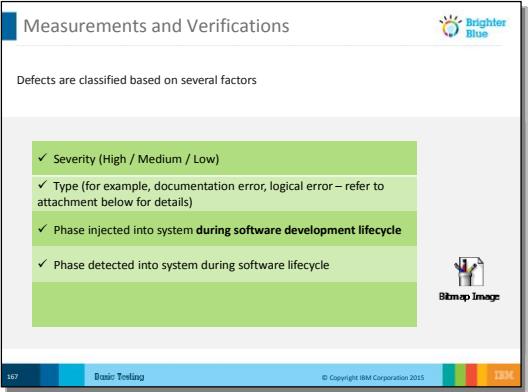
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| <p>Slide 161</p> <div data-bbox="392 421 916 812"><p>Spot quiz</p><p>07 Which of the following is not a role in facilitation review?</p><p>A Producer B Review Leader</p><p>C Director D Reader</p><p>161 Basic Testing © Copyright IBM Corporation 2015 IBM</p></div> | |

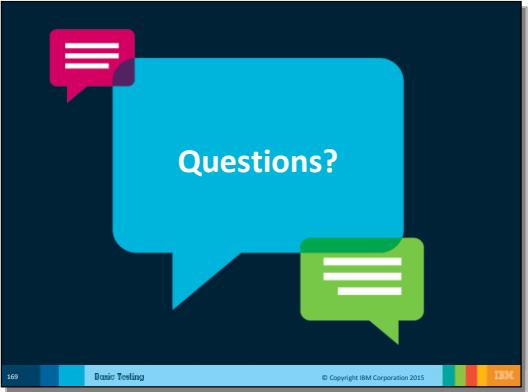
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| <p>Slide 162</p>  <p>A spot quiz slide titled "Spot quiz". The question is "08 In a facilitation review, the product owner:". Below the question are four options labeled A, B, C, and D. Option A: Initiates the review process. Option B: Distributes material to be reviewed. Option C: Manages the entire review process and ensures that review process is adhered to. Option D: Participates as an inspector. The slide includes a navigation bar at the bottom with icons for back, forward, search, and other presentation controls.</p> | |

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| <p>Slide 163</p>  <p>A screenshot of a 'Spot quiz' slide titled '09'. The question asks: 'Which of the following is not true about a recorder in facilitation review?' Below are four options:</p> <ul style="list-style-type: none">A Classifies errorsB Understands the material being reviewedC Takes confirmation on each recorded errorD Records all review comments <p>The slide footer includes '163 Basic Testing © Copyright IBM Corporation 2015' and the IBM logo.</p> | |

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| <p>Slide 164</p> <div data-bbox="394 421 918 816"><p>Measurements and Verifications</p><p>Defect classification is essential for analyzing defects and understanding their trend in order to prevent their occurrence in the future. Following measurements are collected from the process.</p><ul style="list-style-type: none">✓ Number of defects✓ Effort experience on reviews✓ Size of work product✓ Rework effort✓ Defect escapes (in form of Defect Origin)<p>ISS Basic Testing © Copyright IBM Corporation 2015 IBM</p></div> | |

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| <p>Slide 165</p> <div data-bbox="394 421 918 816"><p>Measurements and Verifications</p><p>The review comments or defects are classified as one of the following degree:</p><ul style="list-style-type: none">✓ Critical✓ High✓ Medium✓ Low✓ Suggestion<p>Basic Testing © Copyright IBM Corporation 2015 </p></div> | |

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| <p>Slide 166</p>  <p>The slide is titled "Measurements and Verifications" and features the Brighter Blue logo. It states that defects are classified based on several factors:</p> <ul style="list-style-type: none">✓ Severity (High / Medium / Low)✓ Type (for example, documentation error, logical error – refer to attachment below for details)✓ Phase injected into system during software development lifecycle✓ Phase detected into system during software lifecycle <p>At the bottom, there is a "Bitmap Image" placeholder and footer text: "157 Basic Testing © Copyright IBM Corporation 2015".</p> <p>Refer to the Supporting Documents_Day 1 folder for the embedded image.</p> | |

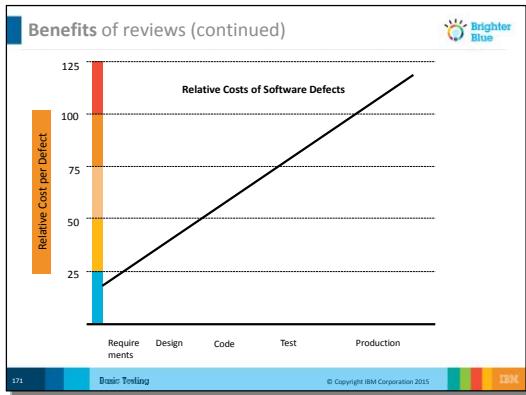
| Slide Content | Use this space for your notes |
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| <p>Slide 167</p>  <p>A dark blue slide with a large light blue speech bubble in the center containing the text "Questions?". There are two smaller speech bubbles, one pink on the left and one green on the right, each with three horizontal lines inside. At the bottom, there is a thin horizontal bar with several colored squares and the text "IBM Basic Testing" and "© Copyright IBM Corporation 2015".</p> | |

| Slide Content | Use this space for your notes |
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| <p>Slide 168</p> <div data-bbox="392 421 920 812"><p>Spot quiz</p><p>10 Which of the following measurements is not collected from a review process?</p><p>A Number of defects B Review effort</p><p>C Rework effort D Testing effort</p><p>168 Basic Testing © Copyright IBM Corporation 2015 IBM</p></div> | |

| Slide Content | Use this space for your notes |
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| <p>Slide 169</p> <div style="border: 1px solid #ccc; padding: 10px;"> <p>Benefits of Review</p>  <ul style="list-style-type: none"> 1 Reviews increase quality, which increases management and customer satisfaction. 2 Reviews help to find errors that cannot be detected through testing. 3 It is observed that reviews can find 60-100 % of all defects. 4 Review data can assess or improve quality of work product, software development process and review process. 5 Reviews are a way of using the diversity and power of a group of people. 6 Reviews reduce rework and thus reduce overall project costs. <p>170 Basic Testing © Copyright IBM Corporation 2015 </p> </div> <ul style="list-style-type: none"> ▪ Reviews increase quality—which increases management and customer satisfaction. ▪ Reviews help to find errors that cannot be detected through testing. ▪ It is observed that reviews can find 60-100% of all defects. ▪ Review data can assess or improve quality of: <ul style="list-style-type: none"> ○ Work product ○ Software development process ○ Review process | |

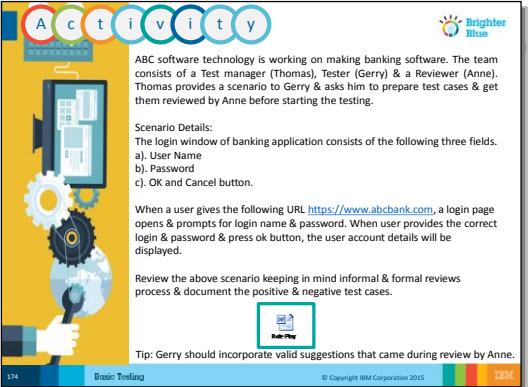
| Slide Content | Use this space for your notes |
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| <ul style="list-style-type: none"> ▪ Reviews are a way of using the diversity and power of a group of people to: <ul style="list-style-type: none"> ○ Detect defects (errors) ○ Remove defects as close to the point of insertion as possible ○ Determine product progress or status ○ Identify potential improvements ○ Produce technical work of a more uniform and predictable quality ○ Gain ownership by the project team ○ Establish an audit trail from systems requirements allocated to software through the successive phases of development (traceability) ▪ Reviews reduce rework and thus reduce overall project cost. <ul style="list-style-type: none"> ○ Rework accounts for 44% of development cost while review accounts for only 15%. ○ The 44% is split as: Requirement (1%), Design (12%), Coding (12%), and Testing (19%). | |

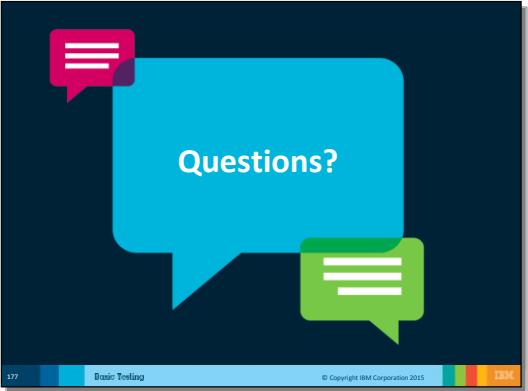
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| <p>Slide 170</p> <div data-bbox="392 421 918 816"><p>Benefits of reviews (continued)</p><p>The graph illustrates the relative cost of removing defects at different stages of software development. The Y-axis represents 'Relative Cost per Defect' from 0 to 125. The X-axis lists phases: Requirements, Design, Code, Test, and Production. A diagonal line shows that defects found earlier in the process are significantly cheaper to fix than those found later. A vertical bar highlights the highest cost point at the Requirements phase.</p><table border="1"><thead><tr><th>Phase</th><th>Relative Cost per Defect (approx.)</th></tr></thead><tbody><tr><td>Requirements</td><td>125</td></tr><tr><td>Design</td><td>75</td></tr><tr><td>Code</td><td>50</td></tr><tr><td>Test</td><td>25</td></tr><tr><td>Production</td><td>100</td></tr></tbody></table><p>© Copyright IBM Corporation 2015</p></div> <p>It is observed that the maximum number of defects are injected during requirements phase itself (Requirements – 56%, Design – 27%, Code – 7%, Other – 10%). Upstream defect removal is 10 to 100 times cheaper. Hence, timely reviews help in keeping project cost under control.</p> | Phase | Relative Cost per Defect (approx.) | Requirements | 125 | Design | 75 | Code | 50 | Test | 25 | Production | 100 | |
| Phase | Relative Cost per Defect (approx.) | | | | | | | | | | | | |
| Requirements | 125 | | | | | | | | | | | | |
| Design | 75 | | | | | | | | | | | | |
| Code | 50 | | | | | | | | | | | | |
| Test | 25 | | | | | | | | | | | | |
| Production | 100 | | | | | | | | | | | | |

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| <p>Slide 171</p> <div style="border: 1px solid black; padding: 10px;"> <p>Review checklist</p> <p>Test Case Review Checklist</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;">Yes</th> <th style="text-align: center;">No</th> <th style="text-align: center;">N/A</th> </tr> </thead> <tbody> <tr> <td>Test Overview</td> <td></td> <td></td> <td></td> </tr> <tr> <td>1. Are the objectives of the testing activities clearly identified?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2. Are all prerequisites and other related documents identified?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3. Does the document describe the type(s) of tests to be addressed?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>4. Does the document describe the scope of the tests to be tested?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>5. For the test type, does the document list all relevant tasks necessary to be performed?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>6. Are the validation tests clearly identified?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>7. Are the regression tests clearly identified?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>8. Are integration tests, including COTS components included?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>9. Is the test plan under version control?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>10. Is the test plan under version control?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Approach</td> <td></td> <td></td> <td></td> </tr> <tr> <td>1. Does the document describe the tactics to be used for the testing activities?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2. Are the test sequences and dependencies defined?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3. Are the tactics and test types aligned with the Master Test Plan?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>General</td> <td></td> <td></td> <td></td> </tr> <tr> <td>1. Are the test instructions clear and easy to follow?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2. Are the test as described likely to yield what's intended?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3. Does the document provide clear evidence of the test results?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>4. Does every test case include a description of the expected output or desired result?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>5. Do the test cases sufficiently documented so as to be 100 % repeatable?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>6. Do the test cases include verification of proper return codes?</td> <td></td> <td></td> <td></td> </tr> <tr> <td>7. Are the Test Cases under version control?</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p style="text-align: right;"> Checklist</p> </div> <p>Refer to the Supporting Documents_Day 1 folder for the embedded file.</p> | | Yes | No | N/A | Test Overview | | | | 1. Are the objectives of the testing activities clearly identified? | | | | 2. Are all prerequisites and other related documents identified? | | | | 3. Does the document describe the type(s) of tests to be addressed? | | | | 4. Does the document describe the scope of the tests to be tested? | | | | 5. For the test type, does the document list all relevant tasks necessary to be performed? | | | | 6. Are the validation tests clearly identified? | | | | 7. Are the regression tests clearly identified? | | | | 8. Are integration tests, including COTS components included? | | | | 9. Is the test plan under version control? | | | | 10. Is the test plan under version control? | | | | Approach | | | | 1. Does the document describe the tactics to be used for the testing activities? | | | | 2. Are the test sequences and dependencies defined? | | | | 3. Are the tactics and test types aligned with the Master Test Plan? | | | | General | | | | 1. Are the test instructions clear and easy to follow? | | | | 2. Are the test as described likely to yield what's intended? | | | | 3. Does the document provide clear evidence of the test results? | | | | 4. Does every test case include a description of the expected output or desired result? | | | | 5. Do the test cases sufficiently documented so as to be 100 % repeatable? | | | | 6. Do the test cases include verification of proper return codes? | | | | 7. Are the Test Cases under version control? | | | | |
| | Yes | No | N/A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Test Overview | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 2. Are all prerequisites and other related documents identified? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Does the document describe the type(s) of tests to be addressed? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. Does the document describe the scope of the tests to be tested? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. For the test type, does the document list all relevant tasks necessary to be performed? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. Are the validation tests clearly identified? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7. Are the regression tests clearly identified? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8. Are integration tests, including COTS components included? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9. Is the test plan under version control? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10. Is the test plan under version control? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Approach | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Does the document describe the tactics to be used for the testing activities? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. Are the test sequences and dependencies defined? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Are the tactics and test types aligned with the Master Test Plan? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 1. Are the test instructions clear and easy to follow? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. Are the test as described likely to yield what's intended? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Does the document provide clear evidence of the test results? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. Does every test case include a description of the expected output or desired result? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. Do the test cases sufficiently documented so as to be 100 % repeatable? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. Do the test cases include verification of proper return codes? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7. Are the Test Cases under version control? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| <p>Slide 172</p> <div style="border: 1px solid black; padding: 10px;"> <p>Return on Investment (ROI)</p> <p>ROI helps to justify the cost of reviews.</p> <p>The model for ROI bases the savings on the cost avoidance associated with the detection and correction of defects earlier rather than later in the product evolution cycle.</p> <p>A major defect that leaks from development to testing may cost as much as ten times to detect and correct.</p> <p>Some defects, undetected in test, continue to leak from test to customer use, and may cost an additional ten times to detect and correct.</p> <p>A minor defect may cost two to three times to correct later.</p> <p>Defects leaking from code to test cost nine times more to detect and correct, and defects leaking from test to the field cost thirteen times more.</p> </div> <p>Note:</p> <p>ROI helps to justify the cost of reviews. It is calculated as follows:</p> <p>ROI = Net Savings / Detection Cost</p> <p>Where, Net Savings = Cost to Repair – Cost Avoidance</p> <p>Detection Cost = Cost of Preparation Effort + Cost of Effort to Conduct Review</p> | |

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| <p>Slide 173</p> <div style="border: 1px solid black; padding: 10px;">  <p>ABC software technology is working on making banking software. The team consists of a Test manager (Thomas), Tester (Gerry) & a Reviewer (Anne). Thomas provides a scenario to Gerry & asks him to prepare test cases & get them reviewed by Anne before starting the testing.</p> <p>Scenario Details: The login window of banking application consists of the following three fields.</p> <ul style="list-style-type: none"> a). User Name b). Password c). OK and Cancel button. <p>When a user gives the following URL https://www.abcbank.com, a login page opens & prompts for login name & password. When user provides the correct login & password & press ok button, the user account details will be displayed.</p> <p>Review the above scenario keeping in mind informal & formal reviews process & document the positive & negative test cases.</p> <p>Tip: Gerry should incorporate valid suggestions that came during review by Anne.</p> <p>174 Basic Testing © Copyright IBM Corporation 2015</p> </div> <p>Refer to the Supporting Documents_Day 1 for the embedded file.</p> | |

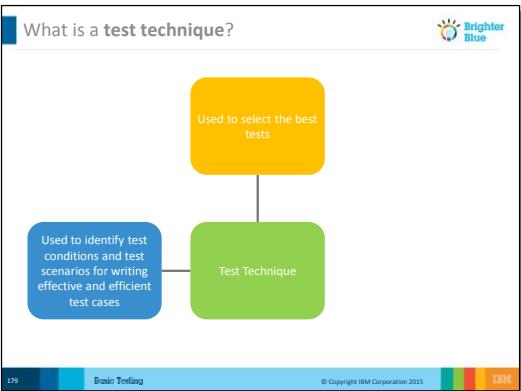
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| <p>Slide 174</p>  | |

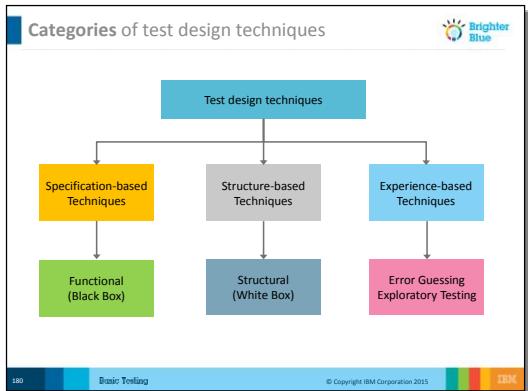
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| <p>Slide 175</p> <div data-bbox="392 421 920 816"><p>Spot quiz</p><p>11 Review data can assess / improve the quality of all but one of the following:</p><p>A Work product B Software development process</p><p>C Reviewer D Review process</p><p>175 Basic Testing © Copyright IBM Corporation 2015 </p></div> | |

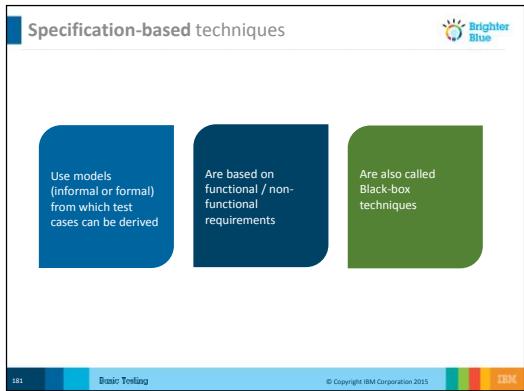
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| <p>Slide 176</p> <p>Spot quiz</p> <p>12 ROI stands for:</p> <p>A Return Of Investment B Return On Investment</p> <p>C Return On Inspection D Return Of Inspection</p> <p>176 Basic Testing © Copyright IBM Corporation 2015 </p> | |

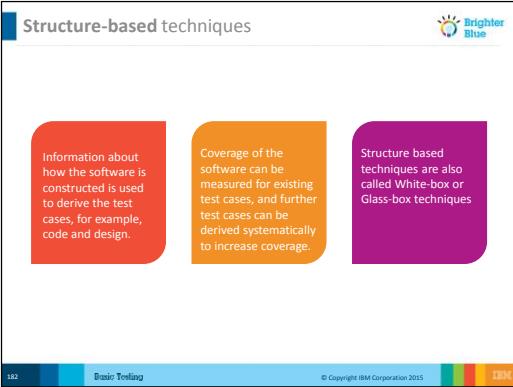
Module 4: Testing Design Techniques and Approach

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| <p>Slide 177</p>  <p>At the end of this module, you should be able to:</p> <ul style="list-style-type: none">▪ Identify test conditions for designing test cases▪ Describe categories and types of test design techniques▪ List the components of a test case template | |

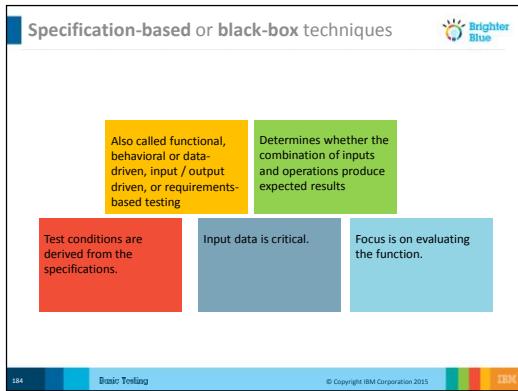
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| <p>Slide 178</p>  <pre> graph TD A[Used to identify test conditions and test scenarios for writing effective and efficient test cases] --- B[Test Technique] B --- C[Used to select the best tests] </pre> <p>The diagram illustrates the purpose of test techniques. It features three rounded rectangular boxes. The bottom-left box is blue and contains the text: "Used to identify test conditions and test scenarios for writing effective and efficient test cases". An arrow points from this box to the bottom-right box, which is green and labeled "Test Technique". Another arrow points from the "Test Technique" box to the top box, which is yellow and says "Used to select the best tests". The entire diagram is set against a white background with a thin black border.</p> <ul style="list-style-type: none"> ▪ Test techniques are used to select the best tests from the infinite number of all possible tests for a given system. ▪ Test techniques are used to identify test conditions and test scenarios through which effective and efficient test cases can be written. ▪ Test techniques help to achieve high test coverage and define tests that will provide insight into the quality of the test object. | |

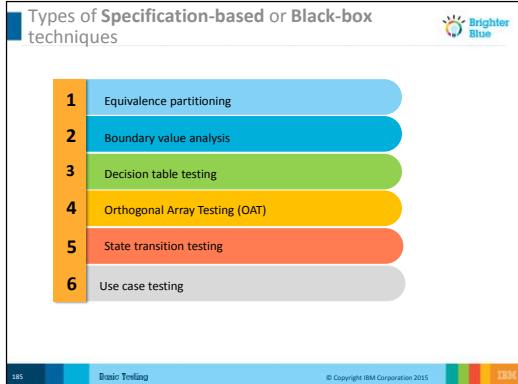
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| <p>Slide 179</p>  <pre>graph TD; TD[Test design techniques] --> SBT[Specification-based Techniques]; TD --> SBT[Structure-based Techniques]; TD --> EBT[Experience-based Techniques]; SBT --> FB[Functional (Black Box)]; SBT --> WB[Structural (White Box)]; EBT --> EG[Error Guessing Exploratory Testing];</pre> <p>The flowchart illustrates the categories of test design techniques. It starts with a general category 'Test design techniques' at the top, which branches into three main types: 'Specification-based Techniques', 'Structure-based Techniques', and 'Experience-based Techniques'. 'Specification-based Techniques' further branches into 'Functional (Black Box)' and 'Structural (White Box)'. 'Experience-based Techniques' branches into 'Error Guessing Exploratory Testing'.</p> | |

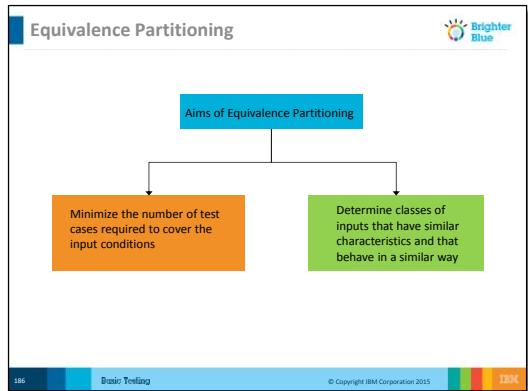
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| <p>Slide 180</p> <div data-bbox="413 421 937 812"><p>Specification-based techniques</p><p>The slide content is contained within a white rectangular box with rounded corners. At the top left is a blue vertical bar with the text 'Specification-based techniques'. At the top right is the Brighter Blue logo. Below this, there are three rounded rectangular boxes: a blue one on the left containing the text 'Use models (informal or formal) from which test cases can be derived'; a dark blue one in the middle containing 'Are based on functional / non-functional requirements'; and a green one on the right containing 'Are also called Black-box techniques'. At the bottom of the slide is a horizontal navigation bar with several colored squares and the text 'IBI Basic Testing'.</p></div> | |

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| <p>Slide 181</p>  <p>181 Basic Testing © Copyright IBM Corporation 2015 IBM</p> | |

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| <p>Slide 182</p>  <p>The slide content is titled "Experience-based techniques". It features two blue rounded rectangular callouts. The left callout contains the text: "Knowledge and experience of people like testers, developers, users are used to derive the test cases." The right callout contains the text: "Knowledge of software, its usage, its environment, likely defects, and its distribution is required for deriving test cases." At the bottom of the slide, there is a navigation bar with icons for back, forward, and search, and the text "IBM Basic Testing © Copyright IBM Corporation 2015".</p> | |

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| <p>Slide 183</p> <div data-bbox="413 421 931 812"><p>Specification-based or black-box techniques</p><p>This slide content is displayed within a frame. At the top left is a blue bar with the text 'Specification-based or black-box techniques'. At the top right is the Brighter Blue logo. Below this, there are three main sections: 1) A yellow box containing the text 'Also called functional, behavioral or data-driven, input / output driven, or requirements-based testing'. 2) A green box containing the text 'Determines whether the combination of inputs and operations produce expected results'. 3) A red box containing the text 'Test conditions are derived from the specifications.', a blue box containing 'Input data is critical.', and a light blue box containing 'Focus is on evaluating the function.' At the bottom of the frame, there is a navigation bar with icons for back, forward, and search, and the text 'IBA Basic Testing'.</p></div> | |

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| <p>Slide 184</p>  <p>Types of Specification-based or Black-box techniques</p> <ol style="list-style-type: none">1 Equivalence partitioning2 Boundary value analysis3 Decision table testing4 Orthogonal Array Testing (OAT)5 State transition testing6 Use case testing <p>IBS Basic Testing © Copyright IBM Corporation 2015 IBM</p> | |

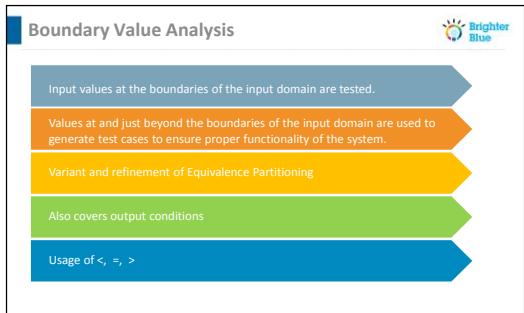
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| <p>Slide 185</p>  <pre> graph TD A[Aims of Equivalence Partitioning] --> B[Minimize the number of test cases required to cover the input conditions] A --> C[Determine classes of inputs that have similar characteristics and that behave in a similar way] </pre> <p>Aims:</p> <ul style="list-style-type: none"> ▪ Minimize the number of test cases required to cover the input conditions ▪ Determine classes of inputs that have similar characteristics and that behave in a similar way. Two test cases based on inputs from the same Equivalence Class are likely to reveal same bug. <p>Identifying Equivalence Classes (ECs):</p> <ul style="list-style-type: none"> ▪ If input specifies a RANGE of valid values, define one EC in the range and one outside each end. | |

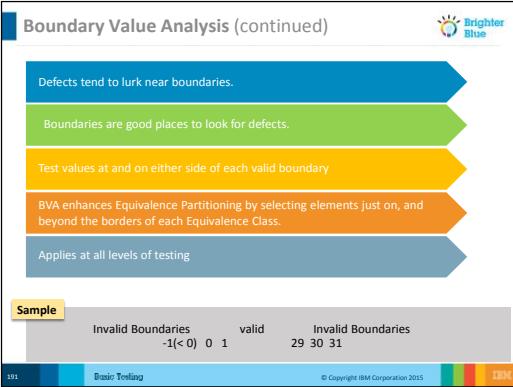
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| <ul style="list-style-type: none">■ If input specifies a NUMBER (N) of valid values, define one valid EC and two invalid ECs (none, and more than N).■ If input specifies a SET of valid values, define one valid EC (within) and one invalid EC (not in).■ If there is a reason to believe the program handles each valid input differently, each valid input is an EC.■ If input specifies Must Be situation, define one valid EC (is) and one invalid EC (is not).■ If there is a reason to believe that elements in an EC are not handled in an identical manner, subdivide the EC into smaller ECs. | |

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| <p>Slide 186</p> <div data-bbox="413 421 937 812"><p>Equivalence Partitioning or equivalence classes</p><p>Equivalence Partitioning or Equivalence Class defines set of valid and invalid states for input condition.</p><p>The inputs and outputs are divided into equivalent classes.</p><p>Equivalence Partitioning (EP) is applicable at all levels of testing.</p><p>Sample</p><p>invalid 0 valid 30 invalid</p><p>187 Basic Testing © Copyright IBM Corporation 2015</p></div> | |

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|--|-------------------------------------|---|--------------|--------|--------------|------------------|--------------|-----|--------------|--------|--------------|------------------|---|-------------------------------------|---|--|
| <p>Slide 187</p> <div style="border: 1px solid black; padding: 10px;"> <p>Equivalence Partitioning or equivalence classes (continued)</p> <p>Example:</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #90EE90;">Salary range</th> <th style="background-color: #90EE90;">Tax</th> </tr> </thead> <tbody> <tr> <td>1000 to 2500</td> <td>No tax</td> </tr> <tr> <td>2501 to 4000</td> <td>5% of the salary</td> </tr> </tbody> </table> <p>Consider the tax slabs:</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #90EE90;">Salary range</th> <th style="background-color: #90EE90;">Tax</th> </tr> </thead> <tbody> <tr> <td>1000 to 2500</td> <td>No tax</td> </tr> <tr> <td>2501 to 4000</td> <td>5% of the salary</td> </tr> </tbody> </table> <p>In Equivalence, we divide the range as the following classes:</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td style="background-color: #1E8449; color: white; padding: 5px;">C1 – Invalid values: ▪ From 0 to 999</td> <td style="background-color: #2ECC71; color: white; padding: 5px;">C2 – No tax: ▪ From 1000 to 2500</td> <td style="background-color: #F39C12; color: white; padding: 5px;">C3 – Tax 5% of the salary: ▪ From 2501 to 4000</td> </tr> </table> <p style="text-align: center; font-size: small; margin-top: 10px;"> IBM Basic Testing IBM IBM Basic Testing IBM </p> <p>To put this in simpler words, since it is practically infeasible to do exhaustive testing, the next best alternative is to check whether the program extends similar behavior or treatment to a certain group of inputs. If such a group of values can be found in the input domain, treat them together as one equivalent class and test one representative from this class.</p> </div> | Salary range | Tax | 1000 to 2500 | No tax | 2501 to 4000 | 5% of the salary | Salary range | Tax | 1000 to 2500 | No tax | 2501 to 4000 | 5% of the salary | C1 – Invalid values: ▪ From 0 to 999 | C2 – No tax: ▪ From 1000 to 2500 | C3 – Tax 5% of the salary: ▪ From 2501 to 4000 | |
| Salary range | Tax | | | | | | | | | | | | | | | |
| 1000 to 2500 | No tax | | | | | | | | | | | | | | | |
| 2501 to 4000 | 5% of the salary | | | | | | | | | | | | | | | |
| Salary range | Tax | | | | | | | | | | | | | | | |
| 1000 to 2500 | No tax | | | | | | | | | | | | | | | |
| 2501 to 4000 | 5% of the salary | | | | | | | | | | | | | | | |
| C1 – Invalid values: ▪ From 0 to 999 | C2 – No tax: ▪ From 1000 to 2500 | C3 – Tax 5% of the salary: ▪ From 2501 to 4000 | | | | | | | | | | | | | | |

| Slide Content | Use this space for your notes | | | | |
|---|---|--------------|---|---|--|
| <p>Slide 188</p> <div data-bbox="413 421 931 812"><p>Equivalence Partitioning: Advantages and disadvantages</p><table border="1"><thead><tr><th data-bbox="460 507 671 532">Advantage</th><th data-bbox="692 507 882 532">Disadvantage</th></tr></thead><tbody><tr><td data-bbox="460 540 671 654"><ul style="list-style-type: none">By identifying and testing one input of each partition, we gain a 'good' coverage with 'small' number of test cases.Testing one input of a partition should be as good as testing any inputs of the partition.</td><td data-bbox="692 540 882 654"><ul style="list-style-type: none">Does not test every inputNo guidelines for choosing inputsHeuristic-based approachVery limited focusNot guaranteed that the system under test treats all sets of an equivalence class in the same way</td></tr></tbody></table><p>188 Basic Testing © Copyright IBM Corporation 2015 </p></div> | Advantage | Disadvantage | <ul style="list-style-type: none">By identifying and testing one input of each partition, we gain a 'good' coverage with 'small' number of test cases.Testing one input of a partition should be as good as testing any inputs of the partition. | <ul style="list-style-type: none">Does not test every inputNo guidelines for choosing inputsHeuristic-based approachVery limited focusNot guaranteed that the system under test treats all sets of an equivalence class in the same way | |
| Advantage | Disadvantage | | | | |
| <ul style="list-style-type: none">By identifying and testing one input of each partition, we gain a 'good' coverage with 'small' number of test cases.Testing one input of a partition should be as good as testing any inputs of the partition. | <ul style="list-style-type: none">Does not test every inputNo guidelines for choosing inputsHeuristic-based approachVery limited focusNot guaranteed that the system under test treats all sets of an equivalence class in the same way | | | | |

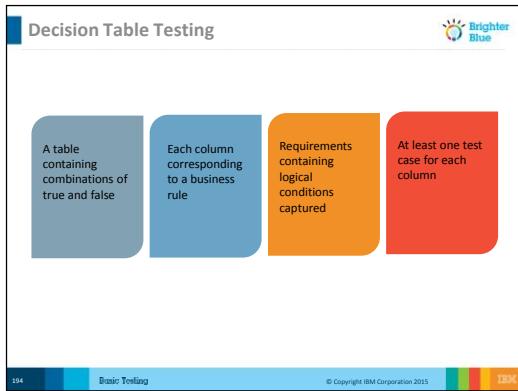
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| <p>Slide 189</p> <div data-bbox="413 421 937 812"><p>Boundary Value Analysis</p><ul style="list-style-type: none">Input values at the boundaries of the input domain are tested.Values at and just beyond the boundaries of the input domain are used to generate test cases to ensure proper functionality of the system.Variant and refinement of Equivalence PartitioningAlso covers output conditionsUsage of <, =, ><p>© Copyright IBM Corporation 2015</p></div> | |

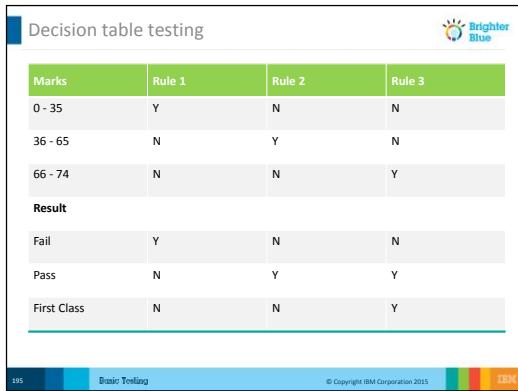
| Slide Content | Use this space for your notes |
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| <p>Slide 190</p>  <p>The slide title is "Boundary Value Analysis (continued)". It features five horizontal arrows pointing right, each containing a statement: "Defects tend to lurk near boundaries.", "Boundaries are good places to look for defects.", "Test values at and on either side of each valid boundary.", "BVA enhances Equivalence Partitioning by selecting elements just on, and beyond the borders of each Equivalence Class.", and "Applies at all levels of testing". Below the arrows is a section titled "Sample" showing a number line from -1 to 31 divided into three regions: "Invalid Boundaries" (-1 < 0), "valid" (0, 1), and "Invalid Boundaries" (29, 30, 31). The bottom of the slide includes navigation icons for back, forward, and search, along with the text "191 Basic Testing © Copyright IBM Corporation 2015".</p> | |

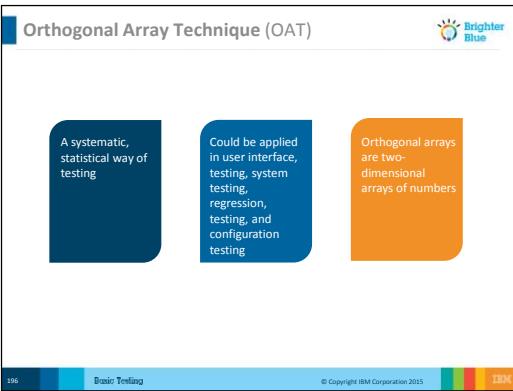
| Slide Content | Use this space for your notes | | | | | | | | | | | | | | | |
|---|--|---|--------------|--------|--------------|------------------|---|--|---|------------------------|---|----------------------|------------------------|---|----------------------|--|
| <p>Slide 191</p> <div style="border: 1px solid black; padding: 10px;"> <p>Boundary Value Analysis: Example</p> <p>Consider the tax slabs:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Salary range</th> <th>Tax</th> </tr> </thead> <tbody> <tr> <td>1000 to 2500</td> <td>No tax</td> </tr> <tr> <td>2501 to 4000</td> <td>5% of the salary</td> </tr> </tbody> </table> <p>In Equivalence, we divide the range as the following classes:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>C1 – Invalid values: • From 0 to 999</td> <td>C2 – Valid values - No tax: • From 1000 to 2500</td> <td>C3 – Tax 5% of the salary: • From 2501 to 4000</td> </tr> </table> <p>In Boundary Value Analysis, analyze the boundaries with the following values:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Lower boundary (1000):</td> <td>→</td> <td>1000-1, 1000, 1000+1</td> </tr> <tr> <td>Upper boundary (2500):</td> <td>→</td> <td>2500-1, 2500, 2500+1</td> </tr> </table> <p style="text-align: center;">IBM Basic Testing © Copyright IBM Corporation 2015</p> </div> <p>Consider that for salary between 1000-2500---->no tax and from 2501-4000---->tax 5% of their Salary.</p> <p>In EQUIVALENCE : we divide the range as the following classes:</p> <ul style="list-style-type: none"> - from 0 to 999 is put together in one class c1- invalid values - from 1000 to 2500 in class c2 – no tax- Valid values - from 2501 to 4000 in class c3- 5% of their salary <p>Boundary Value: taking the above example</p> <p>We would be analyzing the lower boundary (1000) with values as 1000-1,1000 and 1000+1</p> <p>Similarly the upper boundary (2500) would be tested with values as 2500-1, 2500 and 2500+1 for the class which is eligible for No Tax.</p> | Salary range | Tax | 1000 to 2500 | No tax | 2501 to 4000 | 5% of the salary | C1 – Invalid values: • From 0 to 999 | C2 – Valid values - No tax: • From 1000 to 2500 | C3 – Tax 5% of the salary: • From 2501 to 4000 | Lower boundary (1000): | → | 1000-1, 1000, 1000+1 | Upper boundary (2500): | → | 2500-1, 2500, 2500+1 | |
| Salary range | Tax | | | | | | | | | | | | | | | |
| 1000 to 2500 | No tax | | | | | | | | | | | | | | | |
| 2501 to 4000 | 5% of the salary | | | | | | | | | | | | | | | |
| C1 – Invalid values: • From 0 to 999 | C2 – Valid values - No tax: • From 1000 to 2500 | C3 – Tax 5% of the salary: • From 2501 to 4000 | | | | | | | | | | | | | | |
| Lower boundary (1000): | → | 1000-1, 1000, 1000+1 | | | | | | | | | | | | | | |
| Upper boundary (2500): | → | 2500-1, 2500, 2500+1 | | | | | | | | | | | | | | |

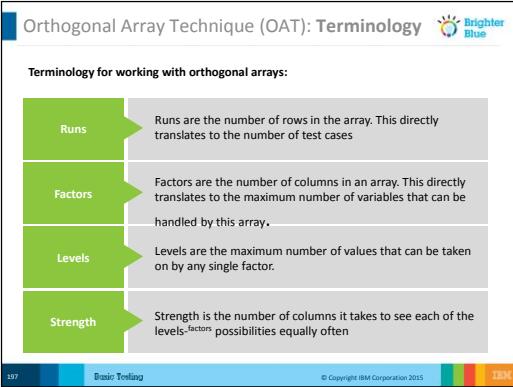
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| <p>Similarly we can also do the boundary value analysis for the class which is charged with 5% tax.</p> | |

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|---|---|--------------|---|---|--|
| <p>Slide 192</p> <div data-bbox="413 421 937 812"><p>Boundary Value Analysis: Advantages and disadvantages</p><table border="1"><thead><tr><th data-bbox="445 507 656 532">Advantage</th><th data-bbox="656 507 868 532">Disadvantage</th></tr></thead><tbody><tr><td data-bbox="445 532 656 633"><ul style="list-style-type: none">Very good at exposing potential user interface / user input problemsVery clear guidelines on determining test casesVery small set of test cases generated</td><td data-bbox="656 532 868 600"><ul style="list-style-type: none">Does not test all possible inputsDoes not test dependencies between combinations of inputs</td></tr></tbody></table><p>192 Basic Testing © Copyright IBM Corporation 2015</p></div> | Advantage | Disadvantage | <ul style="list-style-type: none">Very good at exposing potential user interface / user input problemsVery clear guidelines on determining test casesVery small set of test cases generated | <ul style="list-style-type: none">Does not test all possible inputsDoes not test dependencies between combinations of inputs | |
| Advantage | Disadvantage | | | | |
| <ul style="list-style-type: none">Very good at exposing potential user interface / user input problemsVery clear guidelines on determining test casesVery small set of test cases generated | <ul style="list-style-type: none">Does not test all possible inputsDoes not test dependencies between combinations of inputs | | | | |

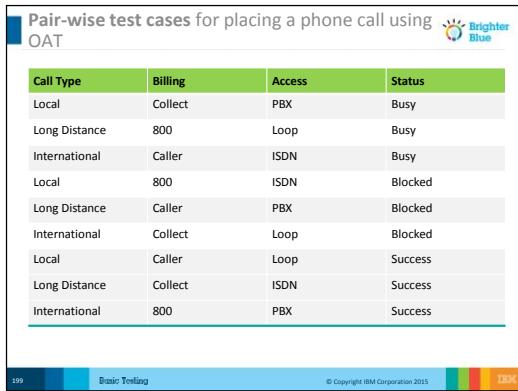
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| <p>Slide 193</p> <div data-bbox="413 421 931 812"><p>Decision Table Testing</p><p>A table containing combinations of true and false</p><p>Each column corresponding to a business rule</p><p>Requirements containing logical conditions captured</p><p>At least one test case for each column</p><p>194 Basic Testing © Copyright IBM Corporation 2015</p></div> <p>Characteristics of Decision Table Testing:</p> <ul style="list-style-type: none">▪ A table contains combinations of true and false for all input conditions and the resulting actions for each.▪ Each column corresponds to a business rule that defines a unique combination of conditions that result in the execution of the actions associated with that rule.▪ Requirements that contain logical conditions can be captured.▪ At least one test case is written per column. | |

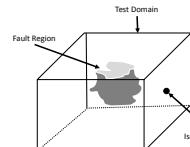
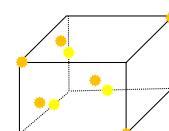
| Slide Content | Use this space for your notes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|-------------------------------|--------|-------------|--------|--------|---|---|---|---------|---|---|---|---------|---|---|---|--|------|------|-------------|------|---|---|---|------|---|---|---|-------------|---|---|---|--|
| <p>Slide 194</p> <div data-bbox="413 421 931 812"><p>Decision table testing</p><p>A decision table titled "Decision table testing". It has three columns: Marks, Rule 1, Rule 2, and Rule 3. The rows are: 0 - 35 (Y, N, N), 36 - 65 (N, Y, N), and 66 - 74 (N, N, Y). Below this is a "Result" section with three rows: Fail (Y, N, N), Pass (N, Y, Y), and First Class (N, N, Y). The slide footer includes the IBM logo, "Basic Testing", and copyright information.</p><p>Marks</p><table border="1"><thead><tr><th>Marks</th><th>Rule 1</th><th>Rule 2</th><th>Rule 3</th></tr></thead><tbody><tr><td>0 - 35</td><td>Y</td><td>N</td><td>N</td></tr><tr><td>36 - 65</td><td>N</td><td>Y</td><td>N</td></tr><tr><td>66 - 74</td><td>N</td><td>N</td><td>Y</td></tr></tbody></table><p>Result</p><table border="1"><thead><tr><th></th><th>Fail</th><th>Pass</th><th>First Class</th></tr></thead><tbody><tr><td>Fail</td><td>Y</td><td>N</td><td>N</td></tr><tr><td>Pass</td><td>N</td><td>Y</td><td>Y</td></tr><tr><td>First Class</td><td>N</td><td>N</td><td>Y</td></tr></tbody></table><p>IBM Basic Testing © Copyright IBM Corporation 2015</p></div> | Marks | Rule 1 | Rule 2 | Rule 3 | 0 - 35 | Y | N | N | 36 - 65 | N | Y | N | 66 - 74 | N | N | Y | | Fail | Pass | First Class | Fail | Y | N | N | Pass | N | Y | Y | First Class | N | N | Y | |
| Marks | Rule 1 | Rule 2 | Rule 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 - 35 | Y | N | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 36 - 65 | N | Y | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 66 - 74 | N | N | Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Fail | Pass | First Class | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fail | Y | N | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pass | N | Y | Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| First Class | N | N | Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

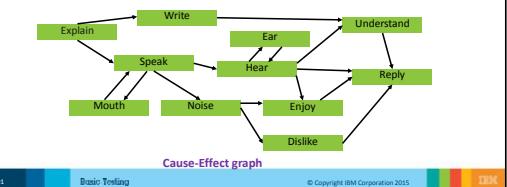
| Slide Content | Use this space for your notes |
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| <p>Slide 195</p>  <p>The slide content includes:</p> <ul style="list-style-type: none"> A systematic, statistical way of testing Could be applied in user interface, testing, system testing, regression, testing, and configuration testing Orthogonal arrays are two-dimensional arrays of numbers <p>Characteristics of Orthogonal Array Technique:</p> <ul style="list-style-type: none"> ▪ Orthogonal Array Technique / Testing is a systematic, statistical way of testing. ▪ Orthogonal arrays could be applied in user interface testing, system testing, regression testing, and configuration testing. ▪ Orthogonal arrays are two-dimensional arrays of numbers which possess the interesting quality that by choosing any two columns in the array you receive an even distribution of all the pair-wise combinations of values in the array. | |

| Slide Content | Use this space for your notes |
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| <p>Slide 196</p>  <p>Orthogonal Array Technique (OAT): Terminology</p> <p>Terminology for working with orthogonal arrays:</p> <ul style="list-style-type: none">Runs: Runs are the number of rows in the array. This directly translates to the number of test cases.Factors: Factors are the number of columns in an array. This directly translates to the maximum number of variables that can be handled by this array.Levels: Levels are the maximum number of values that can be taken on by any single factor.Strength: Strength is the number of columns it takes to see each of the levels-factors possibilities equally often <p>197 Basic Testing © Copyright IBM Corporation 2015</p> | |

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|--|-------------------------------|---------|---------|--------|-------|--------|------|---------|---------------|---------|------|------|---------------|-----|-----|---------|--|
| <p>Slide 197</p> <div style="border: 1px solid black; padding: 10px;"> <p>Example of OAT</p> <p>Parameters for placing a telephone call:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Call Type</th> <th>Billing</th> <th>Access</th> <th>Status</th> </tr> </thead> <tbody> <tr> <td>Local</td> <td>Caller</td> <td>Loop</td> <td>Success</td> </tr> <tr> <td>Long Distance</td> <td>Collect</td> <td>ISDN</td> <td>Busy</td> </tr> <tr> <td>International</td> <td>800</td> <td>PBX</td> <td>Blocked</td> </tr> </tbody> </table> <p>The above table defines:</p> <ul style="list-style-type: none"> 4 Factors (Parameters) 3 Levels (Values) 81 Runs ($3^4 = 81$ different scenarios) <p style="font-size: small; color: gray; margin-top: 10px;">IBM Basic Testing © Copyright IBM Corporation 2015</p> </div> | Call Type | Billing | Access | Status | Local | Caller | Loop | Success | Long Distance | Collect | ISDN | Busy | International | 800 | PBX | Blocked | |
| Call Type | Billing | Access | Status | | | | | | | | | | | | | | |
| Local | Caller | Loop | Success | | | | | | | | | | | | | | |
| Long Distance | Collect | ISDN | Busy | | | | | | | | | | | | | | |
| International | 800 | PBX | Blocked | | | | | | | | | | | | | | |

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|---|-------------------------------|---------|---------|--------|-------|---------|-----|------|---------------|-----|------|------|---------------|--------|------|------|-------|-----|------|---------|---------------|--------|-----|---------|---------------|---------|------|---------|-------|--------|------|---------|---------------|---------|------|---------|---------------|-----|-----|---------|--|
| <p>Slide 198</p> <div data-bbox="413 421 931 812"><p>Pair-wise test cases for placing a phone call using OAT</p><table border="1"><thead><tr><th>Call Type</th><th>Billing</th><th>Access</th><th>Status</th></tr></thead><tbody><tr><td>Local</td><td>Collect</td><td>PBX</td><td>Busy</td></tr><tr><td>Long Distance</td><td>800</td><td>Loop</td><td>Busy</td></tr><tr><td>International</td><td>Caller</td><td>ISDN</td><td>Busy</td></tr><tr><td>Local</td><td>800</td><td>ISDN</td><td>Blocked</td></tr><tr><td>Long Distance</td><td>Caller</td><td>PBX</td><td>Blocked</td></tr><tr><td>International</td><td>Collect</td><td>Loop</td><td>Blocked</td></tr><tr><td>Local</td><td>Caller</td><td>Loop</td><td>Success</td></tr><tr><td>Long Distance</td><td>Collect</td><td>ISDN</td><td>Success</td></tr><tr><td>International</td><td>800</td><td>PBX</td><td>Success</td></tr></tbody></table><p>198 Basic Testing © Copyright IBM Corporation 2015</p></div> | Call Type | Billing | Access | Status | Local | Collect | PBX | Busy | Long Distance | 800 | Loop | Busy | International | Caller | ISDN | Busy | Local | 800 | ISDN | Blocked | Long Distance | Caller | PBX | Blocked | International | Collect | Loop | Blocked | Local | Caller | Loop | Success | Long Distance | Collect | ISDN | Success | International | 800 | PBX | Success | |
| Call Type | Billing | Access | Status | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Local | Collect | PBX | Busy | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Long Distance | 800 | Loop | Busy | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| International | Caller | ISDN | Busy | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Local | 800 | ISDN | Blocked | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Long Distance | Caller | PBX | Blocked | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| International | Collect | Loop | Blocked | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Local | Caller | Loop | Success | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Long Distance | Collect | ISDN | Success | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| International | 800 | PBX | Success | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

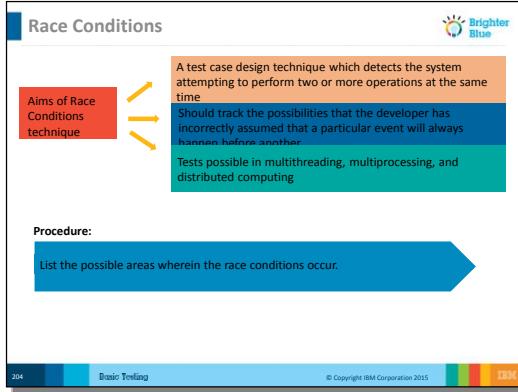
| Slide Content | Use this space for your notes | | | | |
|---|---|------------------------|---|---|--|
| <p>Slide 199</p> <div style="border: 1px solid black; padding: 10px;"> <p>Traditional test case versus test case based on OAT</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #0070C0; color: white;">Traditional Manual Data-Driven Testing</th> <th style="background-color: #0070C0; color: white;">Test Case based on OAT</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;"> <ul style="list-style-type: none"> ▪ Many scenarios to execute and time consuming ▪ High probability of some data getting missed out (during cons / test phase) </td> <td style="padding: 5px;"> <ul style="list-style-type: none"> ▪ Makes sure test cases are evenly / thoroughly distributed </td> </tr> </tbody> </table> <p style="text-align: center;">   </p> <p style="font-size: small; margin-top: 10px;"> 200 Basic Testing © Copyright IBM Corporation 2015  </p> </div> | Traditional Manual Data-Driven Testing | Test Case based on OAT | <ul style="list-style-type: none"> ▪ Many scenarios to execute and time consuming ▪ High probability of some data getting missed out (during cons / test phase) | <ul style="list-style-type: none"> ▪ Makes sure test cases are evenly / thoroughly distributed | |
| Traditional Manual Data-Driven Testing | Test Case based on OAT | | | | |
| <ul style="list-style-type: none"> ▪ Many scenarios to execute and time consuming ▪ High probability of some data getting missed out (during cons / test phase) | <ul style="list-style-type: none"> ▪ Makes sure test cases are evenly / thoroughly distributed | | | | |

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| <p>Slide 200</p> <div style="border: 1px solid black; padding: 10px;"> <p>Cause-Effect Graphing</p> <div style="display: flex; justify-content: space-between;"> <div style="flex: 1;"> <p>Aims of Cause-Effect Graphing</p> <ul style="list-style-type: none"> → A graphical representation of inputs (causes) with their associated outputs (effects) used in designing test cases → Brainstorm session to find out the related causes and effects until we reach the goal → Producing non-redundant, high-yield tests </div> <div style="flex: 1; text-align: right;">  </div> </div> <p>Example:</p>  <pre> graph LR Explain --> Write Explain --> Speak Write --> Understand Speak --> Ear Ear --> Understand Speak --> Mouth Mouth --> Noise Noise --> Enjoy Noise --> Dislike Enjoy --> Reply Dislike --> Reply Understand --> Reply </pre> <p style="text-align: center;">Cause-Effect graph</p> <p style="font-size: small; margin-top: 10px;"> 201 Basic Testing © Copyright IBM Corporation 2015 IBM </p> </div> | |

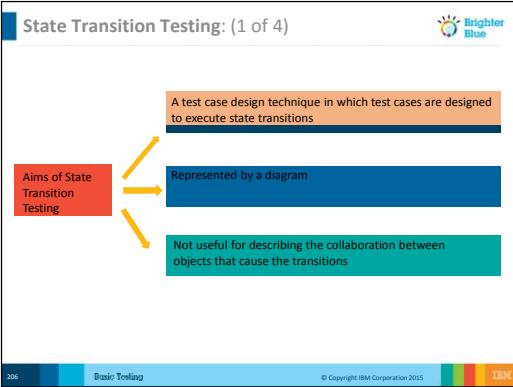
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| <p>Slide 201</p> <div style="border: 1px solid #ccc; padding: 10px;"> <p>Error Guessing</p> <div style="background-color: #f9e79f; padding: 5px; display: flex; align-items: center;"> Aim of the Error Guessing technique Using experience and intuition of the tester to postulate what faults might occur, and to design tests specifically to expose them </div> <p>Important aspects of the procedure are as follows:</p> <div style="background-color: #0070C0; color: white; padding: 5px; border-radius: 10px; width: fit-content;"> <p>It involves making an itemized list of the errors expected to occur in a particular area of the system and then designing a set of test cases to check for these expected errors.</p> <p>It is more testing art than testing science, but can be very effective given a tester familiar with the history of the system.</p> </div> <p style="font-size: small; margin-top: 10px;"> 201 Basic Testing © Copyright IBM Corporation 2015 </p> </div> <p>Aim:</p> <ul style="list-style-type: none"> ▪ A test case design technique where the experience and intuition of the tester is used to postulate what faults might occur, and to design tests specifically to expose them <p>Procedure:</p> <ul style="list-style-type: none"> ▪ Involves making an itemized list of the errors expected to occur in a particular area of the system and then designing a set of test cases to check for these expected errors <ul style="list-style-type: none"> ▪ Empty or Null Strings / Lists | |

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| <ul style="list-style-type: none">▪ Zero Instances / Occurrences▪ It is more testing art than testing science, but can be very effective given a tester familiar with the history of the system. | |

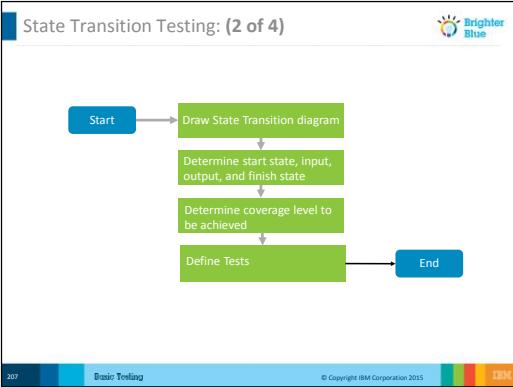
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| <p>Slide 202</p> <div data-bbox="413 421 937 812"><p>Error Guessing: Advantages and disadvantages </p><table border="1"><thead><tr><th data-bbox="451 512 663 535">Advantage</th><th data-bbox="663 512 874 535">Disadvantage</th></tr></thead><tbody><tr><td data-bbox="451 535 663 605"><ul style="list-style-type: none">Can keep track of defect historyLists out all the possible error combinations</td><td data-bbox="663 535 874 605"><ul style="list-style-type: none">Involves tester's experience and ability</td></tr></tbody></table><p>202 Basic Testing © Copyright IBM Corporation 2015 </p></div> | Advantage | Disadvantage | <ul style="list-style-type: none">Can keep track of defect historyLists out all the possible error combinations | <ul style="list-style-type: none">Involves tester's experience and ability | |
| Advantage | Disadvantage | | | | |
| <ul style="list-style-type: none">Can keep track of defect historyLists out all the possible error combinations | <ul style="list-style-type: none">Involves tester's experience and ability | | | | |

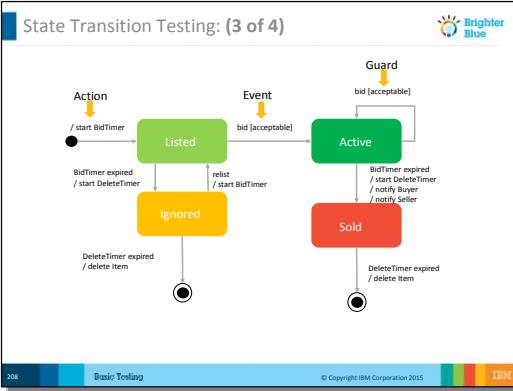
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| <p>Slide 203</p>  <p>Aims of Race Conditions technique</p> <ul style="list-style-type: none"> A test case design technique which detects the system attempting to perform two or more operations at the same time Should track the possibilities that the developer has incorrectly assumed that a particular event will always happen before another Tests possible in multithreading, multiprocessing, and distributed computing <p>Procedure:</p> <ul style="list-style-type: none"> List the possible areas wherein the race conditions occur. | |

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| <p>Slide 204</p> <div data-bbox="413 421 937 812"><p>Race Conditions: Advantages and disadvantages </p><table border="1"><thead><tr><th data-bbox="454 507 665 532">Advantage</th><th data-bbox="665 507 876 532">Disadvantage</th></tr></thead><tbody><tr><td data-bbox="454 532 665 605"><ul style="list-style-type: none">Used for security testingCan be used for testing under heavy load with multiple programs running</td><td data-bbox="665 532 876 605"><ul style="list-style-type: none">Difficult to detect the faultEasily prone to hackers</td></tr></tbody></table><p>205 Basic Testing © Copyright IBM Corporation 2015 </p></div> | Advantage | Disadvantage | <ul style="list-style-type: none">Used for security testingCan be used for testing under heavy load with multiple programs running | <ul style="list-style-type: none">Difficult to detect the faultEasily prone to hackers | |
| Advantage | Disadvantage | | | | |
| <ul style="list-style-type: none">Used for security testingCan be used for testing under heavy load with multiple programs running | <ul style="list-style-type: none">Difficult to detect the faultEasily prone to hackers | | | | |

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| <p>Slide 205</p>  <p>Aim:</p> <ul style="list-style-type: none"> ▪ A test case design technique in which test cases are designed to execute state transitions ▪ Represented by a diagram describing: <ul style="list-style-type: none"> ▪ All of the states that an object can have ▪ The events under which an object changes state (transitions) ▪ The conditions that must be fulfilled before the transition will occur (guards) ▪ The activities undertaken during the life of an object (actions) | |

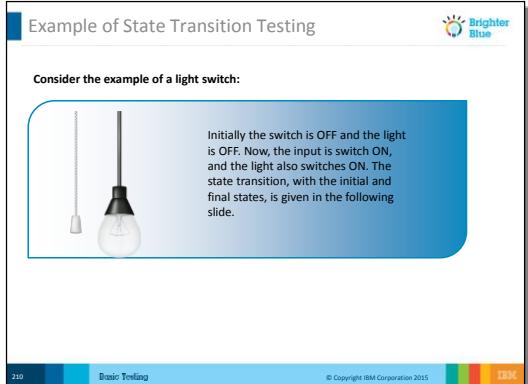
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| <ul style="list-style-type: none">▪ Not useful for describing the collaboration between objects that cause the transitions | |

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| <p>Slide 206</p>  <pre>graph TD; Start([Start]) --> Draw[Draw State Transition diagram]; Draw --> Determine1[Determine start state, input, output, and finish state]; Determine1 --> Determine2[Determine coverage level to be achieved]; Determine2 --> Define[Define Tests]; Define --> End([End]);</pre> <p>207 Basic Testing © Copyright IBM Corporation 2015</p> | |

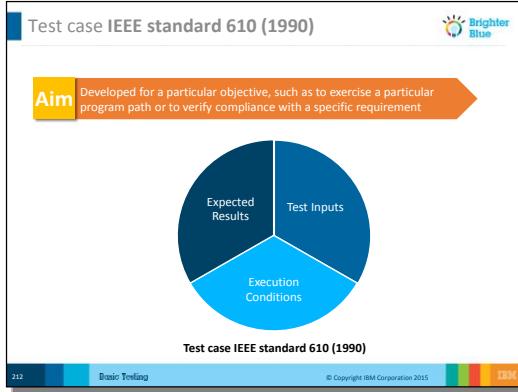
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| <p>Slide 207</p>  <pre> graph LR Start(()) -- "/start BidTimer" --> Listed[>Listed] Listed -- "Event: bid [acceptable]" --> Active[Active] Active -- "Guard: bid [acceptable]" --> Sold[Sold] Active -- "Action: /start DeleteTimer, /notify Buyer, /notify Seller" --> Sold Ignored[Ignored] -- "Event: relist / start BidTimer" --> Listed Sold -- "Action: /start DeleteTimer, /notify Buyer, /notify Seller" --> Ignored Ignored -- "Event: DeleteTimer expired / delete item" --> End(()) Sold -- "Action: /delete item" --> End </pre> <p>The diagram illustrates a state transition testing sequence across four states: Listed, Active, Ignored, and Sold. It shows various events and actions that trigger transitions between these states.</p> <ul style="list-style-type: none"> From Listed: <ul style="list-style-type: none"> Action: /start BidTimer leads to Listed. Event: bid [acceptable] leads to Active. Action: /start DeleteTimer leads to Ignored. From Active: <ul style="list-style-type: none"> Guard: bid [acceptable] leads to Sold. Action: /start DeleteTimer, /notify Buyer, /notify Seller leads to Sold. From Ignored: <ul style="list-style-type: none"> Event: relist / start BidTimer leads to Listed. Action: /start DeleteTimer, /notify Buyer, /notify Seller leads to Ignored. From Sold: <ul style="list-style-type: none"> Action: /start DeleteTimer, /notify Buyer, /notify Seller leads to Ignored. Action: /delete item leads to End. From End: <ul style="list-style-type: none"> Action: /delete item leads to End. | |

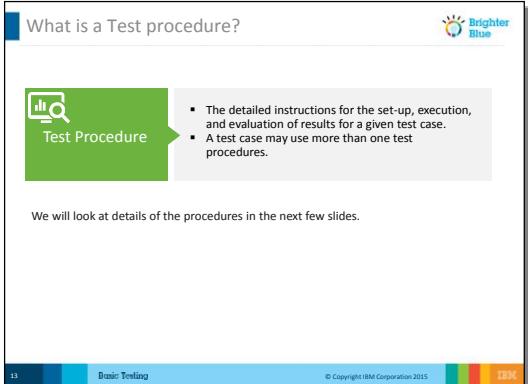
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|---|---|---|--------|---|--------|---|-------------|--|---------|--|--|
| <p>Slide 208</p> <div style="border: 1px solid black; padding: 10px;"> <p>State Transition Testing: (4 of 4) </p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #92D050; color: white; padding: 5px;">State:</td> <td style="padding: 5px;">▪ A condition during the life of an object in which it satisfies some conditions, performs some actions, or waits for some events</td> </tr> <tr> <td style="background-color: #92D050; color: white; padding: 5px;">Event:</td> <td style="padding: 5px;">▪ An occurrence that may trigger a state transition</td> </tr> <tr> <td style="background-color: #92D050; color: white; padding: 5px;">Guard:</td> <td style="padding: 5px;">▪ A Boolean expression which, if true, enables an event to cause a transition</td> </tr> <tr> <td style="background-color: #92D050; color: white; padding: 5px;">Transition:</td> <td style="padding: 5px;">▪ The change of state within an object</td> </tr> <tr> <td style="background-color: #92D050; color: white; padding: 5px;">Action:</td> <td style="padding: 5px;">▪ One or more actions taken by an object in response to a state change</td> </tr> </table> <p style="font-size: small; margin-top: 10px;"> 208 Basic Testing © Copyright IBM Corporation 2015 IBM </p> <p>Terminology:</p> <ul style="list-style-type: none"> ▪ Notation: For those not familiar with the notation used for State Transition diagrams, some explanation is in order. ▪ State: A condition during the life of an object in which it satisfies some conditions, performs some actions, or waits for some events ▪ Event: An occurrence that may trigger a state transition. Event types include an explicit signal from outside the system, an invocation from inside the system, the passage of a designated period of time, or a designated condition becoming true. </div> | State: | ▪ A condition during the life of an object in which it satisfies some conditions, performs some actions, or waits for some events | Event: | ▪ An occurrence that may trigger a state transition | Guard: | ▪ A Boolean expression which, if true, enables an event to cause a transition | Transition: | ▪ The change of state within an object | Action: | ▪ One or more actions taken by an object in response to a state change | |
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| Transition: | ▪ The change of state within an object | | | | | | | | | | |
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| <ul style="list-style-type: none">■ Guard: A Boolean expression which, if true, enables an event to cause a transition■ Transition: The change of state within an object■ Action: One or more actions taken by an object in response to a state change | |

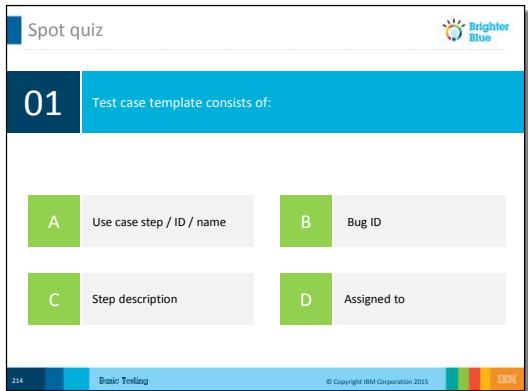
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| <p>Slide 209</p>  <p>The slide content is as follows:</p> <p>Example of State Transition Testing</p> <p>Consider the example of a light switch:</p>  <p>Initially the switch is OFF and the light is OFF. Now, the input is switch ON, and the light also switches ON. The state transition, with the initial and final states, is given in the following slide.</p> <p>210 Basic Testing © Copyright IBM Corporation 2015</p> | |

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| <p>Slide 210</p> <div data-bbox="413 421 937 812"><p>Representation of state transition</p><p>TEST</p><table border="1"><thead><tr><th></th><th>STEP1</th><th>STEP2</th><th>STEP3</th></tr></thead><tbody><tr><td>START STATE</td><td>OFF</td><td>ON</td><td>OFF</td></tr><tr><td>INPUT</td><td>SWITCH ON</td><td>SWITCH OFF</td><td>SWITCH ON</td></tr><tr><td>OUTPUT</td><td>LIGHT ON</td><td>LIGHT OFF</td><td>LIGHT ON</td></tr><tr><td>FINISH STATE</td><td>ON</td><td>OFF</td><td>ON</td></tr></tbody></table><p>211 Basic Testing © Copyright IBM Corporation 2015</p></div> | | STEP1 | STEP2 | STEP3 | START STATE | OFF | ON | OFF | INPUT | SWITCH ON | SWITCH OFF | SWITCH ON | OUTPUT | LIGHT ON | LIGHT OFF | LIGHT ON | FINISH STATE | ON | OFF | ON | |
| | STEP1 | STEP2 | STEP3 | | | | | | | | | | | | | | | | | | |
| START STATE | OFF | ON | OFF | | | | | | | | | | | | | | | | | | |
| INPUT | SWITCH ON | SWITCH OFF | SWITCH ON | | | | | | | | | | | | | | | | | | |
| OUTPUT | LIGHT ON | LIGHT OFF | LIGHT ON | | | | | | | | | | | | | | | | | | |
| FINISH STATE | ON | OFF | ON | | | | | | | | | | | | | | | | | | |

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| <p>Slide 211</p>  <p>A set of:</p> <ul style="list-style-type: none"> ▪ Test Inputs ▪ Execution Conditions ▪ Expected Results <p>Developed for a particular objective, such as to exercise a particular program path or to verify compliance with a specific requirement</p> | |

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| <p>Slide 212</p>  <p>What is a Test procedure?</p> <p>Test Procedure</p> <ul style="list-style-type: none">The detailed instructions for the set-up, execution, and evaluation of results for a given test case.A test case may use more than one test procedures. <p>We will look at details of the procedures in the next few slides.</p> <p>13 Basic Testing © Copyright IBM Corporation 2015</p> | |

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| <p>Slide 213</p>  <p>The key takeaways from this module are:</p> <ul style="list-style-type: none">▪ Identifying test conditions for designing test cases▪ Describing categories and types of test design techniques▪ Listing the components of a test case template | |

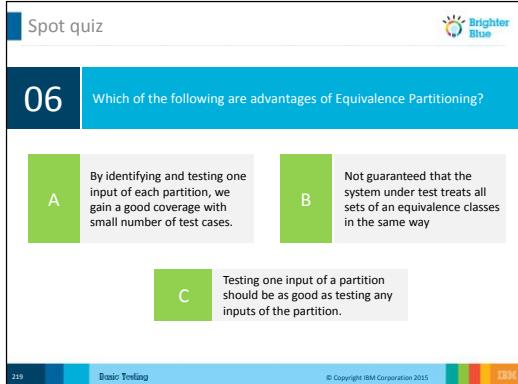
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| <p>Slide 214</p>  <p>The slide displays a 'Spot quiz' interface for a 'Test case template'. The template consists of four items labeled A, B, C, and D:</p> <ul style="list-style-type: none">A: Use case step / ID / nameB: Bug IDC: Step descriptionD: Assigned to <p>At the bottom of the slide, there is navigation information: '214' (slide number), 'Basic Testing' (topic), '© Copyright IBM Corporation 2015' (copyright), and a set of colored navigation icons.</p> | |

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| <p>Slide 215</p> <p>Spot quiz</p> <p>02 In which type of testing technique do we only check the boundary values and + or - of those values?</p> <p>A Equivalence Partitioning B Decision Table Testing</p> <p>C Boundary Value Analysis D Orthogonal Array Technique</p> <p>215 Basic Testing © Copyright IBM Corporation 2015</p> | |

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| <p>Slide 216</p> <div data-bbox="413 421 931 812"><p>Spot quiz</p><p>03 Which of the following has detailed instructions for the set-up, execution, and evaluation of results for a given test case?</p><p>A Test procedure B Test environment</p><p>C Test technique D Test inputs</p><p>216 Basic Testing © Copyright IBM Corporation 2015</p></div> | |

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| <p>Slide 217</p> <div data-bbox="413 421 941 812"><p>Spot quiz</p><p>04 Which of the following is not an aim of Cause – Effect Graphing?</p><p>A A graphical representation of inputs with their associated outputs used in designing test cases</p><p>B Brainstorm session to find out the related causes and effects until we reach the goal</p><p>C Tracking possibilities of incorrect assumptions of a particular event always happening before another</p><p>D Producing non-redundant, high-yield tests</p><p>217 Basic Testing © Copyright IBM Corporation 2015</p></div> | |

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| <p>Slide 218</p> <div data-bbox="413 421 933 812"><p>Spot quiz</p><p>05 Which of the following is not an advantage of Boundary Value Analysis?</p><p>A Very good at exposing potential user interface / user input problems</p><p>B Very clear guidelines on determining test cases</p><p>C Very small set of test cases generated</p><p>D Lists out all the possible error combinations</p><p>218 Basic Testing © Copyright IBM Corporation 2015</p></div> | |

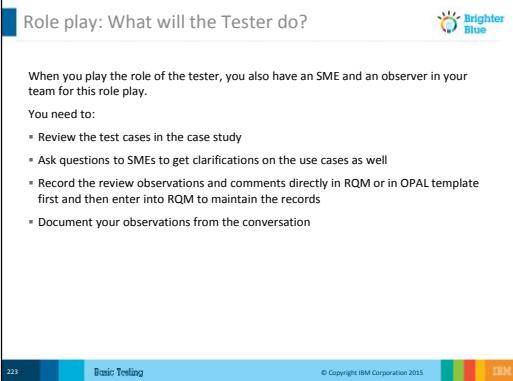
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| <p>Slide 219</p>  <p>06 Which of the following are advantages of Equivalence Partitioning?</p> <p>A By identifying and testing one input of each partition, we gain a good coverage with small number of test cases.</p> <p>B Not guaranteed that the system under test treats all sets of an equivalence classes in the same way</p> <p>C Testing one input of a partition should be as good as testing any inputs of the partition.</p> | |

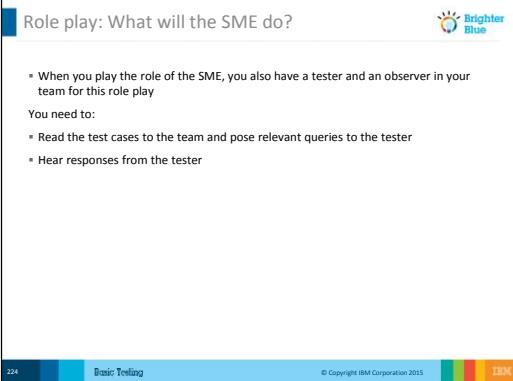
Module 5: Case Study

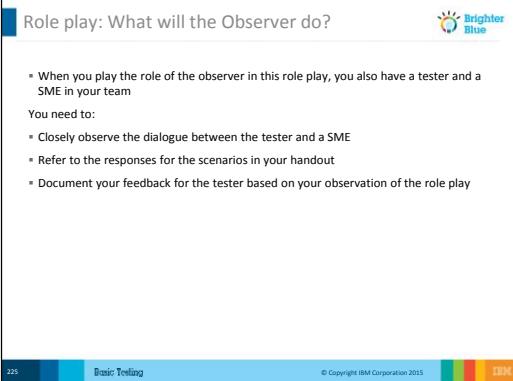
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| <p>Slide 220</p> | |

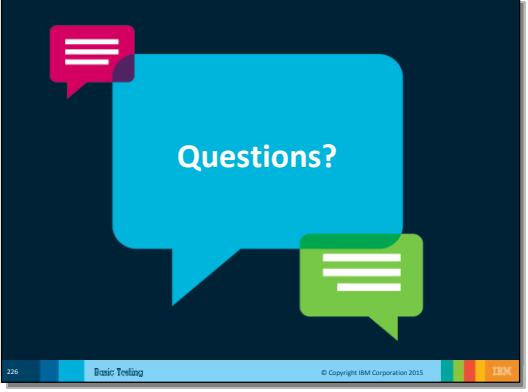
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|  <p>At the end of this module, you should be able to:</p> <ul style="list-style-type: none">• Review the test cases in the case study• Ask questions to SMEs to get clarifications on the use cases• Record the review observations and comments directly in OPAL template first and then enter into RQM to maintain the records | |
| Slide 221 | |

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|  <p>Refer to the Requirements Review doc in the Supporting Documents_Day 1 folder for the embedded file.</p> | |
| Slide 222 | |

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|  <p>Role play: What will the Tester do?</p> <p>When you play the role of the tester, you also have an SME and an observer in your team for this role play.</p> <p>You need to:</p> <ul style="list-style-type: none">▪ Review the test cases in the case study▪ Ask questions to SMEs to get clarifications on the use cases as well▪ Record the review observations and comments directly in RQM or in OPAL template first and then enter into RQM to maintain the records▪ Document your observations from the conversation <p>223 Basic Testing © Copyright IBM Corporation 2015 IBM</p> | |
| Slide 223 | |

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|  <p>Role play: What will the SME do?</p> <p>When you play the role of the SME, you also have a tester and an observer in your team for this role play.</p> <p>You need to:</p> <ul style="list-style-type: none">Read the test cases to the team and pose relevant queries to the testerHear responses from the tester <p>224 Basic Testing © Copyright IBM Corporation 2015 100%</p> | |
| Slide 224 | |

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|  <p>Role play: What will the Observer do?</p> <p>When you play the role of the observer in this role play, you also have a tester and a SME in your team.</p> <p>You need to:</p> <ul style="list-style-type: none">▪ Closely observe the dialogue between the tester and a SME▪ Refer to the responses for the scenarios in your handout▪ Document your feedback for the tester based on your observation of the role play <p>225 Basic Testing © Copyright IBM Corporation 2015 100%</p> | |
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