1. White Box Testing

Definition: Testing the internal workings or logic of the application. The tester needs knowledge of the code, algorithms, and architecture.

Key Features:

- Focuses on code structure, logic, and flow.
- Tests internal paths, conditions, and loops.
- Requires programming skills.

Examples:

1. **Unit Testing**:
   Testing a function that calculates the sum of two numbers to ensure it handles edge cases like negative numbers or zero.

   ```python
   def add(a, b):
       return a + b
   ```

   - Test Case: `add(2, -3)` should return `-1`.
2. **Code Coverage Testing**:
   Checking if all conditional branches in a piece of code are executed. For example:

   ```python
   if age >= 18:
       print("Eligible to vote")
   else:
       print("Not eligible")
   ```

   - Ensuring both the "if" and "else" paths are tested.

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2. Black Box Testing

Definition: Testing the application without any knowledge of its internal code or architecture. Focuses on inputs and outputs.

Key Features:

- Tests functionality, usability, and performance.
- No need for programming knowledge.
- Treats the system as a "black box."

Examples:

1. **Login Feature Testing**:
   Testing if the login page accepts correct credentials and denies incorrect ones without looking at the code.
   - Input: Username: `user123`, Password: `password@123`
   - Expected Output: Login successful.
2. **Boundary Value Analysis**:
   Testing a field that accepts age between 18 and 60.
   - Test Inputs: `17`, `18`, `60`, `61`.
   - Expected Outputs: Invalid for `17` and `61`, Valid for `18` and `60`.

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3. Grey Box Testing

Definition: Combines elements of both White Box and Black Box testing. The tester has partial knowledge of the internal structure but tests from a user perspective.

Key Features:

- Balances internal knowledge with user-oriented testing.
- Can test integration points or database interactions.
- Tester uses knowledge of code for better test design.

Examples:

1. **Database Interaction Testing**:
   Testing a user registration form while knowing how data is stored in the database.
   - Input: Fill out a registration form.
   - Verify: Check if the user details are stored correctly in the database table.
2. **Session Management Testing**:
   Testing a logout feature:
   - Knowledge: Understand that session IDs are invalidated on logout.
   - Test: Log out, then attempt to reuse the session ID to access the application.

Comparison

Aspect	White Box Testing	Black Box Testing	Grey Box Testing
Knowledge Required	Full knowledge of code	No knowledge of code	Partial knowledge of code
Focus	Code structure, logic	Functionality and outputs	Internal and external behavior
Tools	Code analyzers, debuggers	Test management tools	Both types of tools

Aspect	White Box Testing	Black Box Testing	Grey Box Testing
Example	Code coverage, unit testing	UI testing, functional testing	Database and API testing