**Test Cases**

* Unit Testing: Attendance, grade calculation
* Integration Testing: Linking attendance and grades, stock alerts
* System Testing: Result generation, viewing records
* User Acceptance Testing (UAT): Parents and admins validate usability

Fig: Test Case

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| Test Case ID | Feature | Test Type | Input / Action | Expected Output | Test Objective |
| TC 01 | Attendance Tracking | Unit (Positive) | Teacher marks student as present | Attendance updated correctly in system | Verify attendance marking works |
| TC 02 | Attendance Tracking | Unit (Negative) | Teacher marks attendance for a non-existent student ID | System rejects with error message | Ensure validation of student ID |
| TC 03 | Attendance Tracking | Integration | Multiple teachers update attendance simultaneously | All records saved without conflicts | Verify concurrency handling |
| TC 04 | Attendance Tracking | System (Negative) | Internet disconnected during attendance submission | System shows failure, prompts retry | Ensure failure recovery |
| TC 05 | Grade Entry | Unit (Positive) | Teacher enters grade “A” | Grade saved successfully | Verify grade entry |
| TC 06 | Grade Entry | Unit (Negative) | Teacher enters invalid grade “Z” | Error message displayed, grade not saved | Ensure grade validation |
| TC 07 | Result Generation | System (Positive) | Generate results after all grades entered | Ranked result sheet generated | Verify ranking logic |
| TC 08 | Result Generation | System (Negative) | Generate results with missing grades for 1 student | System warns, results not generated until fixed | Ensure input completeness |
| TC 09 | Parent Portal | UAT (Positive) | Parent logs in with valid credentials | Dashboard shows child’s grades and attendance | Verify parent access works |
| TC 10 | Parent Portal | UAT (Negative) | Parent tries to view another child’s records | Access denied (role restriction) | Enforce data privacy |
| TC 11 | Student Portal | Unit (Positive) | Student checks attendance history | Correct attendance records displayed | Verify student portal attendance |
| TC 12 | Student Portal | Unit (Negative) | Student tries to update grades | Access denied (not authorized) | Enforce access control |
| TC 13 | Alerts (Stock) | Integration | Marker stock falls below 10 | Admin receives low-stock alert | Verify alert system for resources |
| TC 14 | Alerts (CCTV) | Integration | CCTV marked as broken | Admin receives immediate alert | Verify CCTV alert function |
| TC 15 | Security & Access Ctrl | System (Negative) | Teacher attempts to access admin panel | Access denied | Verify role-based restrictions |
| TC 16 | Performance | System (Positive) | 1000 students load dashboard simultaneously | Response time (< 2 seconds) | Verify scalability and performance |