Debugging Log

# Defect Information

**Defect ID:** Bug 1 – Incorrect calculation of fines

**Priority:** Major

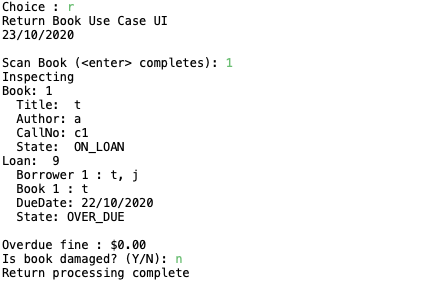
**Status:** VERIFIED

**Last updated:** 2020-10-16

**Assigned to:** Sam Johnson

## Reported Issue

When a book becomes overdue by one day, no fine is imposed.



# Replication

## Setup

* Patron created with data as per Test Data
* Patron state is CAN\_BORROW
* Patron fines are below fine limit
* Book created with data as per Test Data
* Book state is AVAILABLE
* Recorded Patron ID and Book ID

## Tear down

* Remove library.obj file

## Steps

| **#** | **Test Action** | **Expected Results** |
| --- | --- | --- |
| 1 | Enter ‘L’ at the main menu, and press Enter | Borrow Book use case UI starts. Prompt to swipe Patron card. |
| 2 | Enter Patron ID, press Enter | Prompted to scan book. |
| 3 | Enter Book ID, press Enter | Prompted to scan another book. |
| 4 | Press Enter | System displays Final Borrowing List. Prompts to Commit Loans. |
| 5 | Enter ‘Y’, press Enter | Completed Borrowing List displayed, prompted to enter any key to exit. |
| 6 | Press Enter | Main menu displayed |
| 7 | Enter ‘T’, press Enter | Prompted to enter the number of days |
| 8 | Enter Number of Days (3), press Enter | Displays new date followed by main menu |
| 9 | Enter ‘R’, press Enter | Return Book use case UI starts. Prompt to scan book. |
| 10 | Enter Book ID, press Enter | Displays inspecting book, book details, and loan details. Prompted to confirm if book is damaged.  Bug evident: Loan State is OVER\_DUE Overdue Files is $0.00 |
| 11 | Enter ‘N’, press Enter | Main menu is displayed |

## Test Data

| **Description** | | **Data** |
| --- | --- | --- |
| Patron 1 | Last name | Mustermann |
| First name | Max |
| Email | max.mustermann@example.com |
| Phone | 123456789 |
| Book 1 | Author | Herman Melville |
| Title | Moby Dick |
| Call Number | c123 |
| Number of Days | | 3 |

## Replication Comments

Confirmed issue occurs when loan is overdue by a single day. Returning two days late incurs a fine (fine amount is incorrect, already raised as Bug 2). Returning on time functions as expected. Issue is unchanged by the amount of books borrowed.

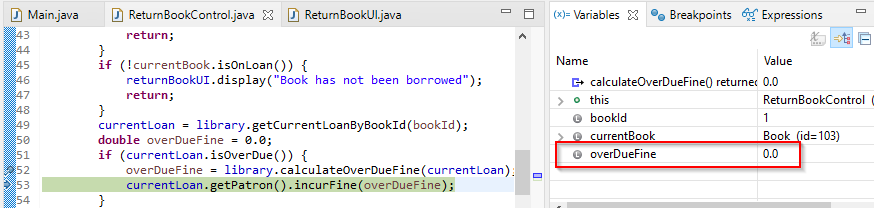
# Simplification/Tracing

|  |  |
| --- | --- |
| **Hypothesis #1** | |
| Defect occurs within ReturnBookControl.bookScanned() processing. | |
| **Expected State** | **Actual State** |
| bookId and patronId remain the same | IDs remained the same |
| Loan State remains OVER\_DUE | State remained OVER\_DUE |
| Fines Payable remains 0.0 | Fines Payable remained the same |
| **Conclusion** | |
| Hypothesis confirmed. Patron fines after bookScanned() should have increased and have not. | |

**Screenshots/Comments:**

|  |  |
| --- | --- |
| **Hypothesis #2** | |
| Defect occurs within the call to library.calculateOverdueFine(currentLoan) | |
| **Expected State** | **Actual State** |
| Return value equals 0.0 | Returns 0.0 |
| **Conclusion** | |
| Hypothesis confirmed. Overdue fine calculation returns 0.0 | |

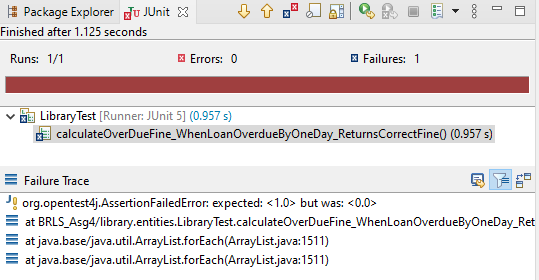
**Screenshots/Comments:**



Can write an automated test for Library.calculateOverdueFine().

Wrote automated test:

LibraryTest. calculateOverDueFine\_WhenLoanOverdueByOneDay\_ReturnsCorrectFine()



|  |  |
| --- | --- |
| **Hypothesis #3** | |
| Defect occurs in Calendar.getDaysDifference() | |
| **Expected State** | **Actual State** |
| Returns 0 | Returns 0 |
|  |  |
| **Conclusion** | |
| Hypothesis confirmed. Method should return 1 but returns 0. | |

**Screenshots/Comments:**

Trace through getDaysDifference() to locate defect.

# Resolution

Defect occurs in the calculation of diffDays where the difference in milliseconds (86400000 = 1 day) is divided by the constant MILLIS\_PER\_DAY. MILLIS\_PER\_DAY has been incorrectly set to 172800000, or the milliseconds in two days.

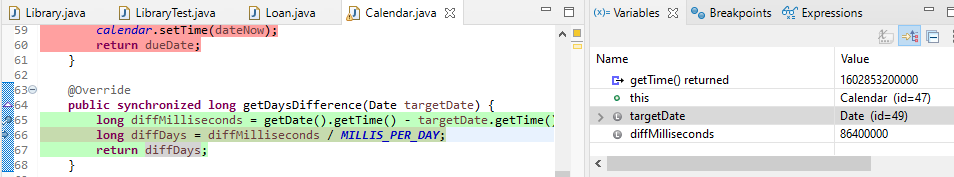


Figure 1: getDaysDifference() - before calculation

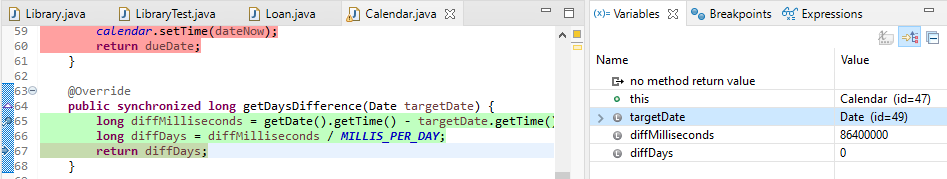


Figure 2: getDaysDifference() - after calculation

Proposed fix: Change MILLIS\_PER\_DAY constant to 86400000.

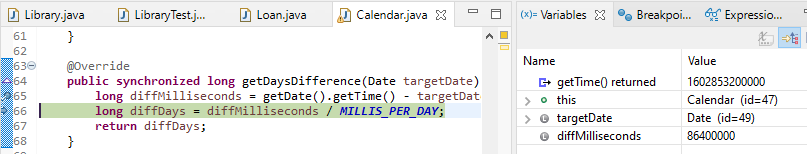


Figure 3: Remediated getDaysDifference() - before calculation

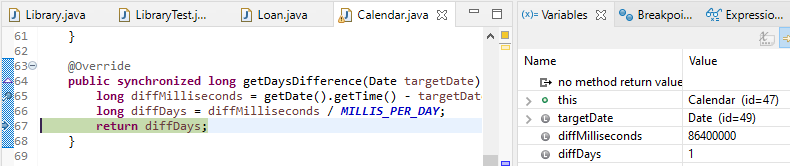


Figure 4: Remediated getDaysDifference() - after calculation

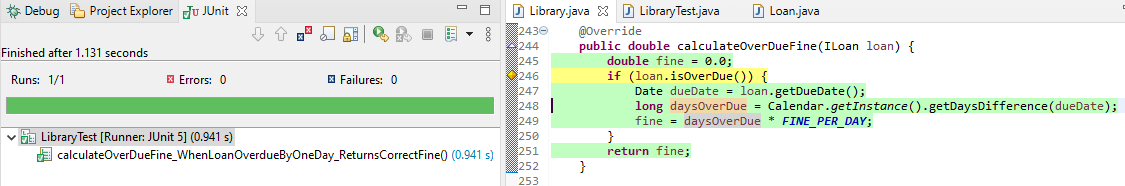


Figure 5: Passing test

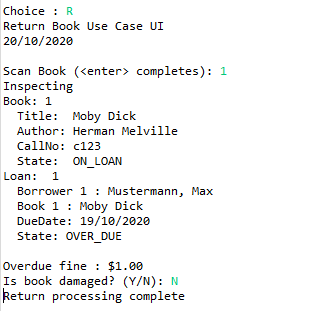


Figure 6: FAT result

Fix has exposed a new defect. Raised as Bug 3: Double fine incurred to patron.

# Regression Testing

Call hierarchy for getDaysDifference() indicates that it is only triggered by calls that initiate in the ReturnBookControl.bookScanned() and ReturnBookControl.dischargeLoan() methods. dischargeLoan() is run after bookScanned() concludes. Regression testing should focus on scenarios where fines are payable.

Testing returning 1 day overdue. Fine is displayed correctly ($1.00) but is incurred as double that amount ($2.00).

Tested returning a single book 2 days overdue. Fine is displayed correctly (Bug 2 appears to be resolved) but fine incurred is double the amount.

Tested returning a single book on time. No fine is incurred as expected.

Tested borrowing 2 books and returning both 2 days overdue. Fines are displayed correctly ($1.00 each book) but fine incurred is double ($4.00).