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1. **Write a short, paragraph-length response interpreting the diagrams. Be sure to address the following questions:**
   * **What case is described by these diagrams?**

The sequence and activity diagrams in UML illustrate the use case of a customer withdrawing cash from an ATM. It begins with the customer inserting the card and inputting the PIN. The ATM then validates the card and PIN. If successful, the customer selects the amount to withdraw. The ATM checks if there are sufficient funds and, if so, dispenses the amount and updates the account.

* + **What interactions are involved in this use case? What information is being passed back and forth?**

The interactions are between the customer, the ATM system, and the bank account database. The data exchanged are the card details, PIN, amount to be withdrawn, account balance, and cash dispensed. The sequence diagram clearly shows the passing message between the customer, ATM, and the account database, while the activity diagram shows the flow of activities.

1. **These diagrams describe one basic design for this use case. Analyze the design by identifying at least two deficiencies in the logic or functionality of the current design. Think about ways that you could address these deficiencies to improve the logic or functionality of the design.**

The current UML diagrams, although they do specify the usual cash withdrawal use case in as much detail, do reflect some design shortcomings. To begin with, there is inadequate handling of not enough money. The diagrams only specify a simple "enough money?" test without saying what the system will do when there is not enough money. A fuller solution would display an "Insufficient Funds" message to the customer and offer alternative action, such as checking the account balance or canceling the transaction. Second, the absence of confirmation or receipt for the transaction is a serious omission. A sign of a receipt, either printed or displayed, is needed for maintaining customer records and generating satisfaction. The receipt should have the amount withdrawn, balance now, and transaction time. Finally, the diagrams don't cover security controls for entering an invalid PIN. A good system would track failed PIN entries and use security controls, such as card retention after a specified number of failed attempts, to restrict possible fraud. The current diagrams don't cover any of these security controls.

1. **Choose one of the deficiencies that you identified. Then reconstruct a UML activity or sequence diagram to improve functionality. Use the CASE tool Lucidchart to reconstruct the diagram. Be sure to use proper UML notation and diagram flow.**

To begin with, there is no explicit error handling PIN input. The figures show that the system proceeds directly to amount selection upon entering the PIN without consideration of the case where the user enters an incorrect PIN. It lacks the important security aspect of canceling the transaction in the event of failure of repeated attempts. Secondly, the diagrams also ignore potential dispensing errors, e.g., the ATM not having the requested denomination or machine failure. The current design takes successful dispensing into account without providing any provision for error handling or notification to the user in case of a malfunction.