RMIT UNIVERSITY

Unified Modeling Language

Activity Diagram and Sequence Diagram

Mojtaba Shahin

Week #7: Lectorial

Classification of UML 2.2 Diagrams*

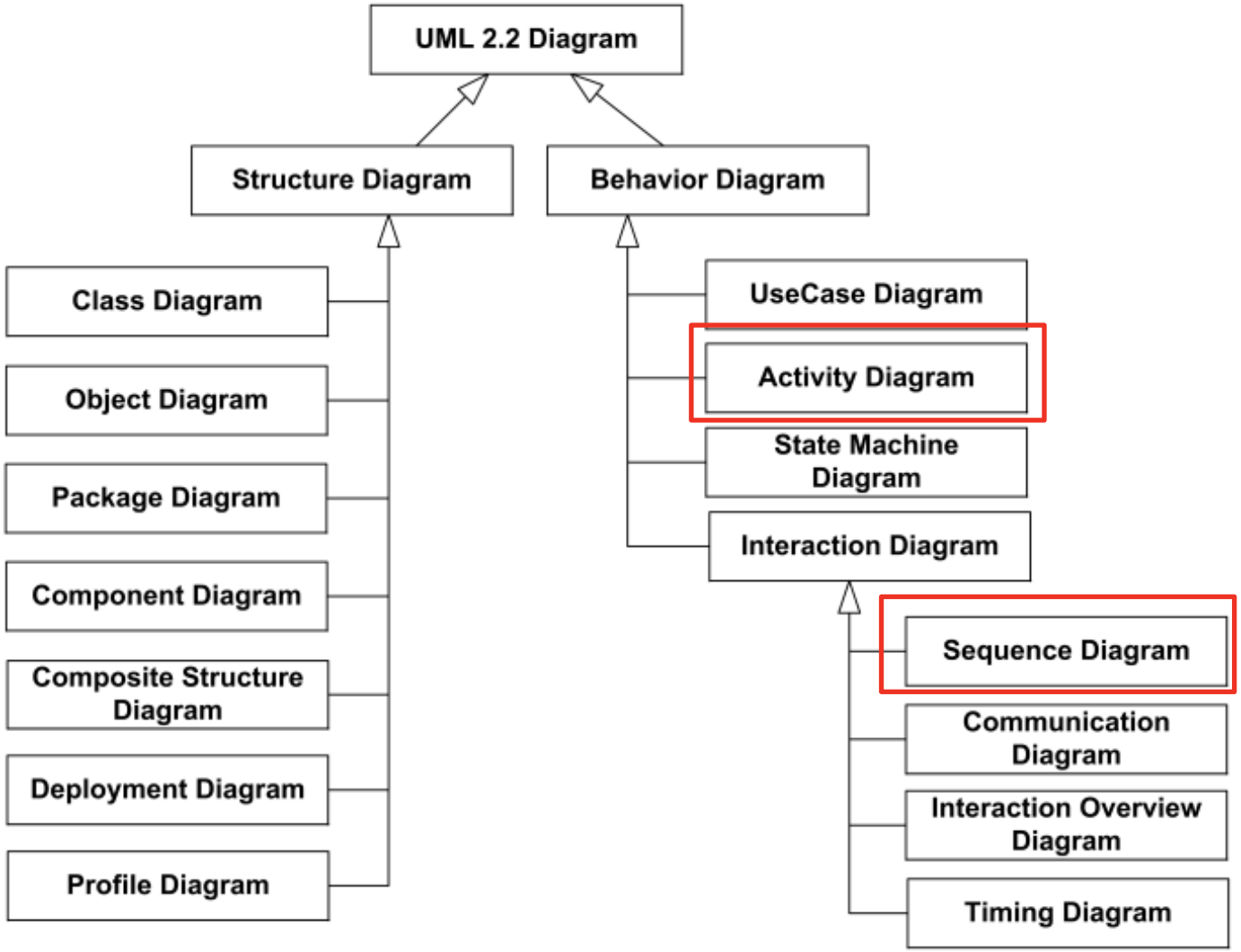
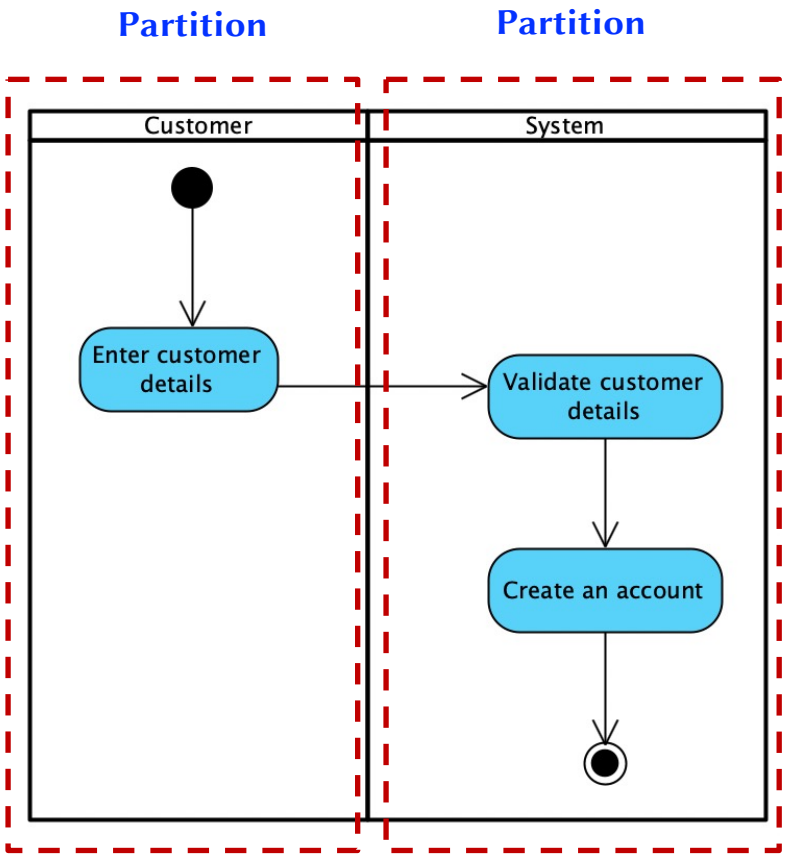


Image Source: https://www.uml-diagrams.org/uml-22-diagrams.html

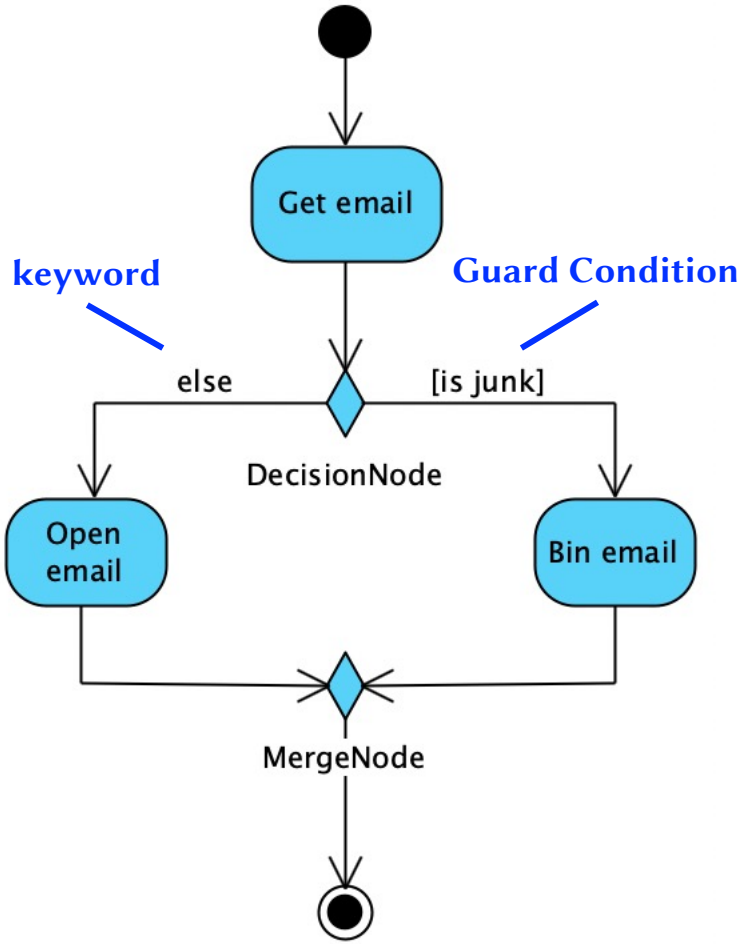
Activity Diagram and Use Case Modeling

Use Case: Create New Customer Account
ID: 5
Brief description This system creates a new account for the Customer.
Primary actors Customer
Secondary actors None
Preconditions None
Main flow 1. The use case starts when the Customer selects "**New Customer Account**" 2. The systems asks the Customer to enter their details comprising email address, password, and password again for confirmation. 3. The system validates the Customer details. 4. The System creates a new account for the Customer.
Postconditions A new account has been created for the Customer.
Alternative flows None



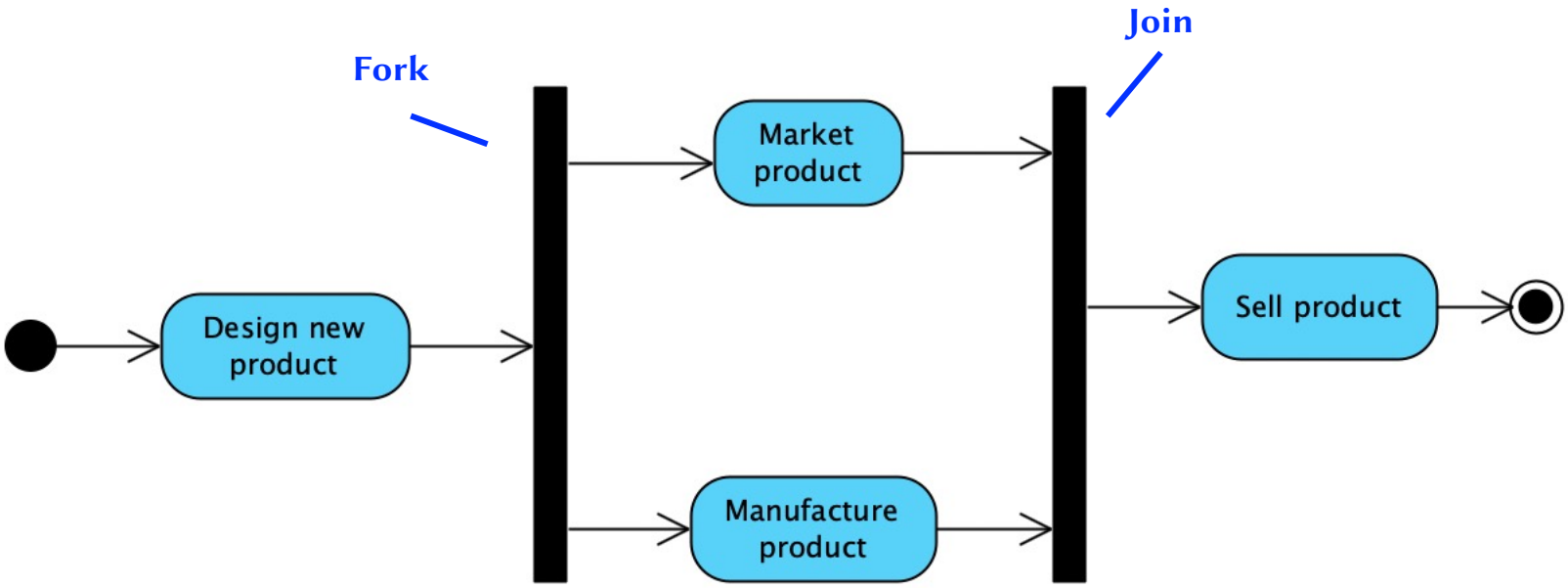
Control Nodes : Decision and Merge

- A **decision**, aka branch, has **a single incoming flow** and **several guarded out-bound flows**.
- Guards are Boolean conditions that
  - must not overlap (otherwise the diagram would be ambiguous)
  - must cover all possibilities
- A **merge** has **multiple input flows** and **a single output**.
  - A merge marks the end of conditional behavior started by a decision.



Control Nodes : Fork and Join

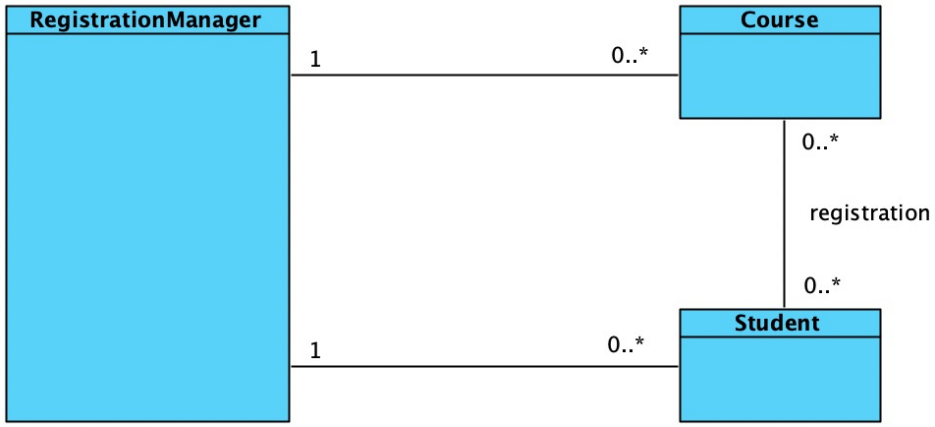
- **Fork** is used to model parallel actions.
- **Join** is used to synchronize parallel actions.
  - With a join, the outgoing flow is taken only when all the incoming flows reach the join.



Sequence Diagrams

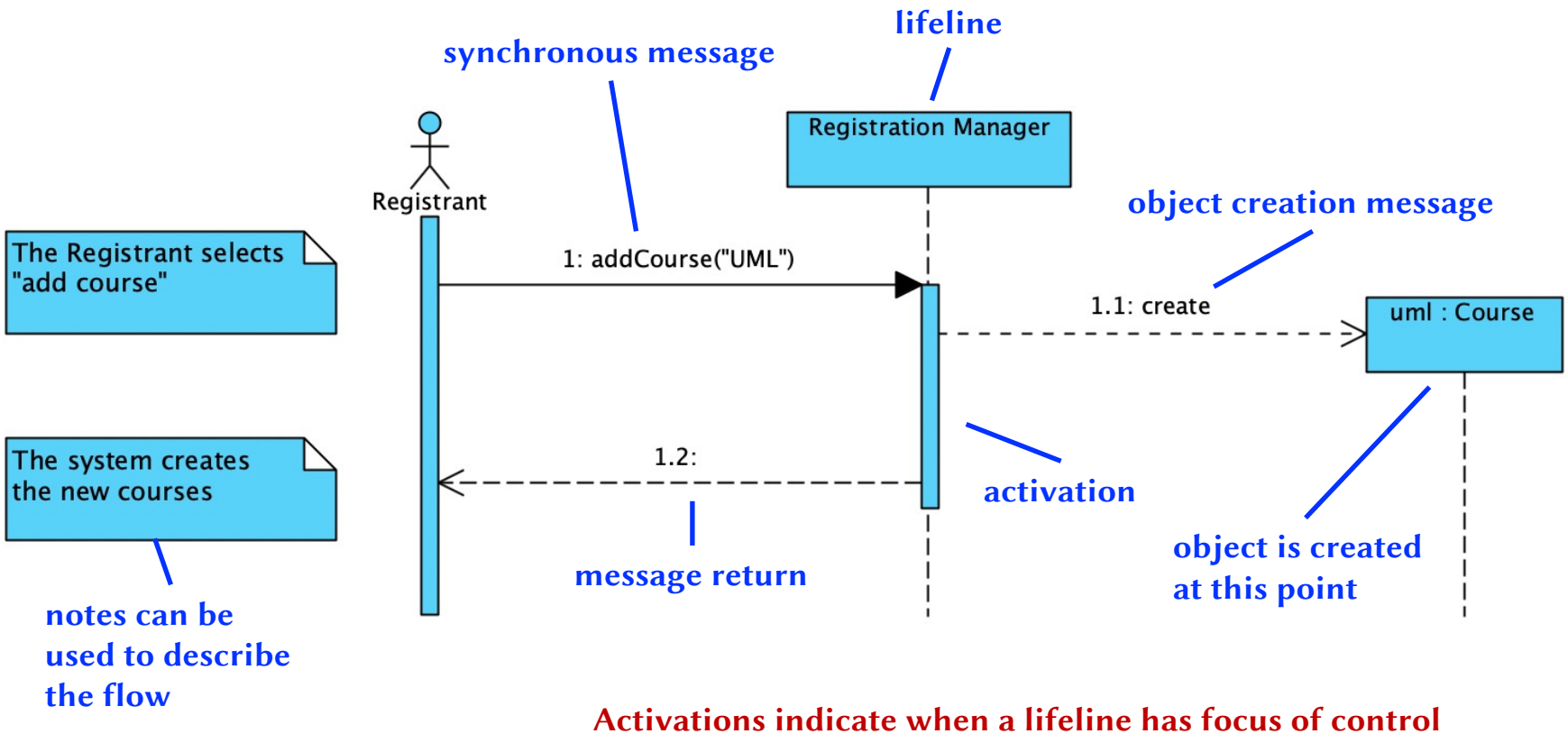
Use Case: AddCourse
ID: 8
Brief description The Registrar adds details of a new course to the system.
Primary actors Registrar
Secondary actors None
Preconditions The Registrar has logged on to the system.
Main flow 1. The Registrar selects “add course”. 2. The Registrar enters the name of the new course. 3. The system creates the new course.
Postconditions A new course has been added to the system
Alternative flows CourseAlreadyExists.

Class Diagram for Course Management System



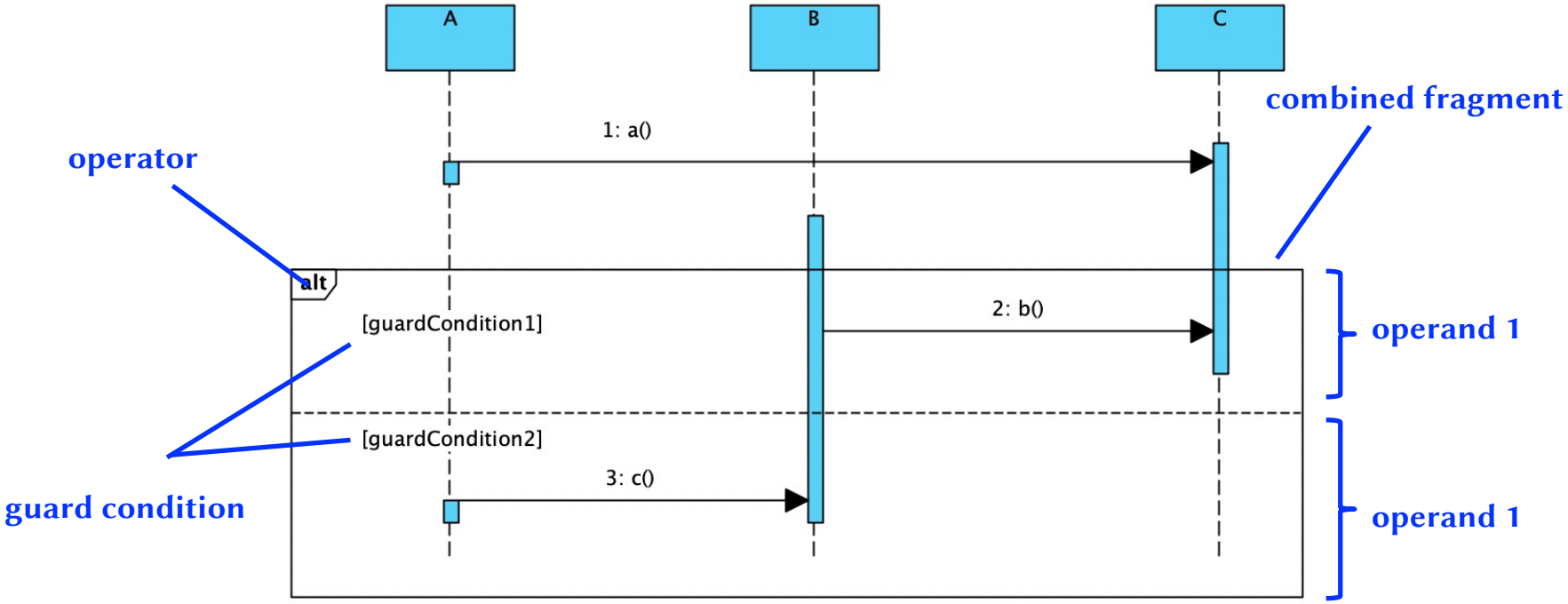
Sequence Diagrams: Example 1 -

A sequence diagram that realizes the behavior of the **AddCourse** use case



Fragments

- Combined fragments divide a sequence diagram into different **areas** with **different behaviour**.
  - The **operator** defines how its operands execute.
  - The **guard condition** defines whether its operand executes.
  - The **operand** contains the behaviour.



Questions, Examples, Discussions

Question

- What is described by a sequence diagram?

  a) link between objects

  b) interaction between objects

  c) generalization of classes

  d) a structure of classes

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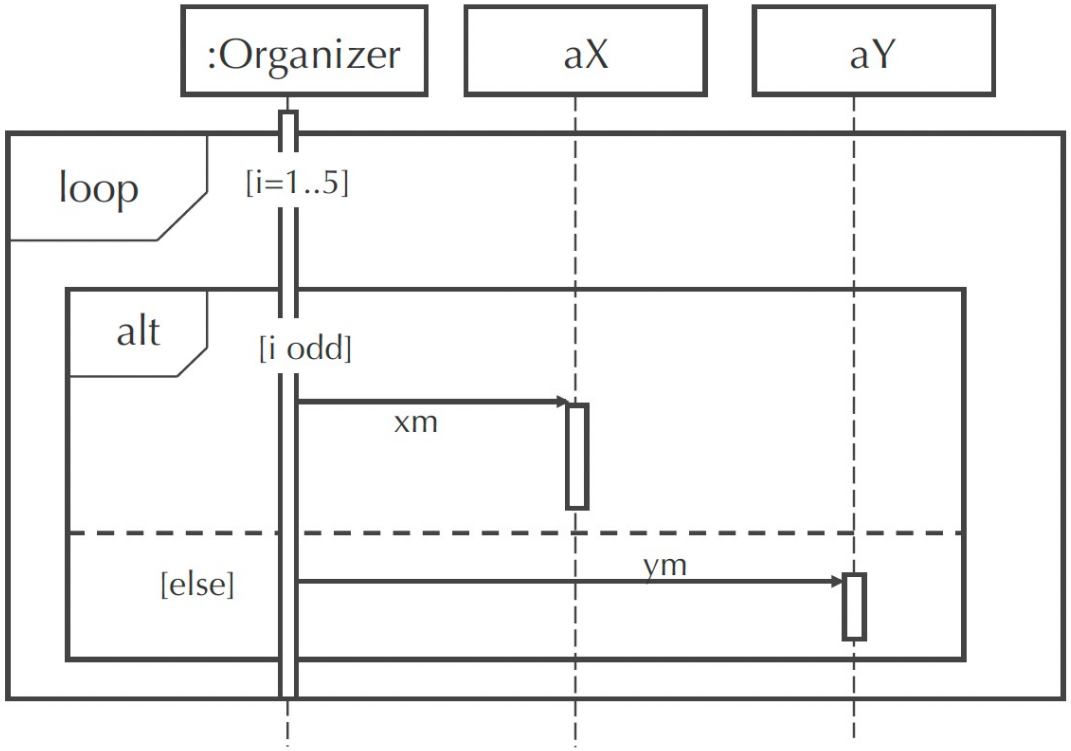
Question 2

- How many times and in what order the methods **xm()** and **ym()** will be called?
  a) xm xm xm ym ym
  b) xm ym xm ym xm
  c) ym xm ym xm ym



Asopted from: http://elearning.uml.ac.at/quiz

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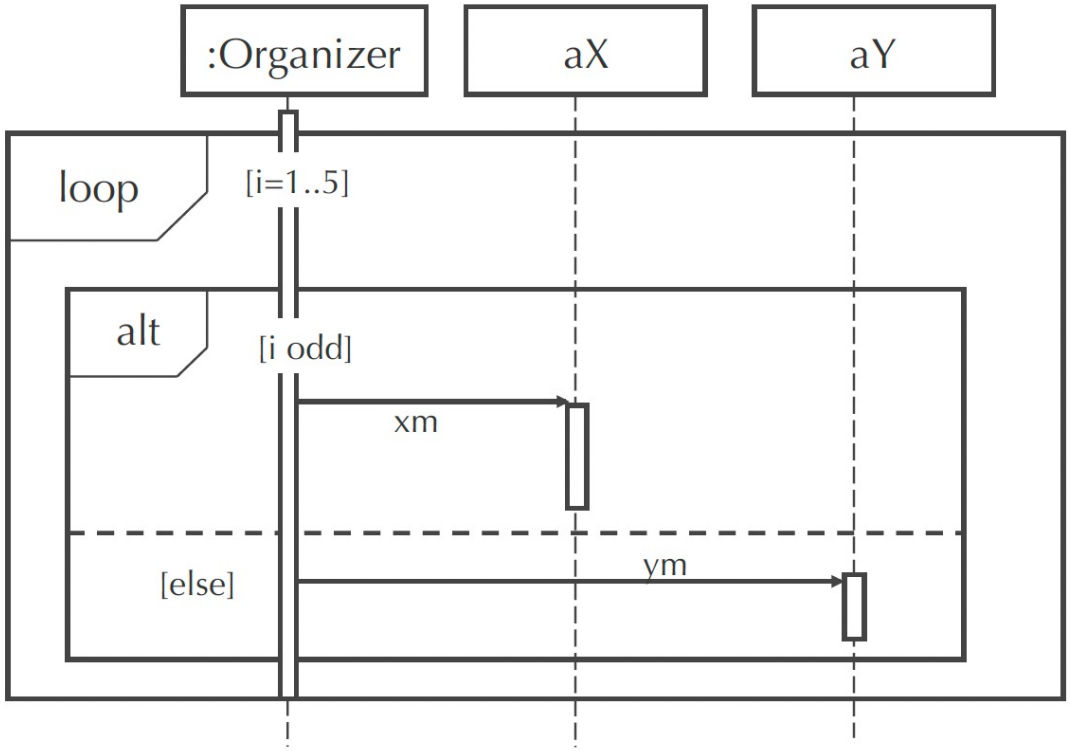

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Question

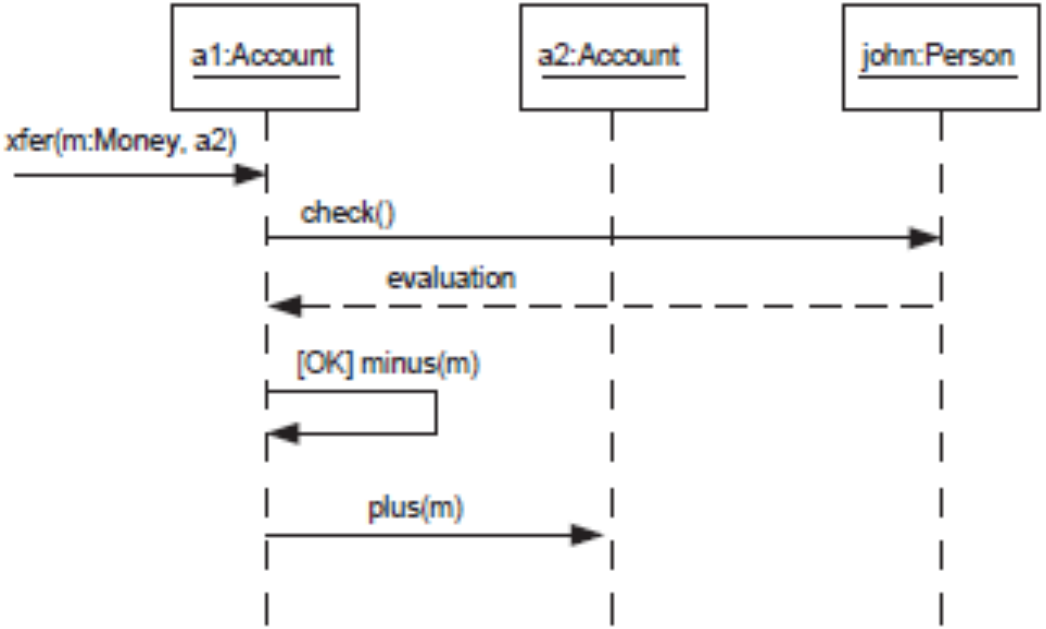
- Given the following diagram, which method(s) should be implemented for the **Account class**?

  (a) xfer()

  (b) xfer(), plus(), minus()

  (c) check(), plus(), minus()

  (d) xfer(), evaluation(), plus(), minus()



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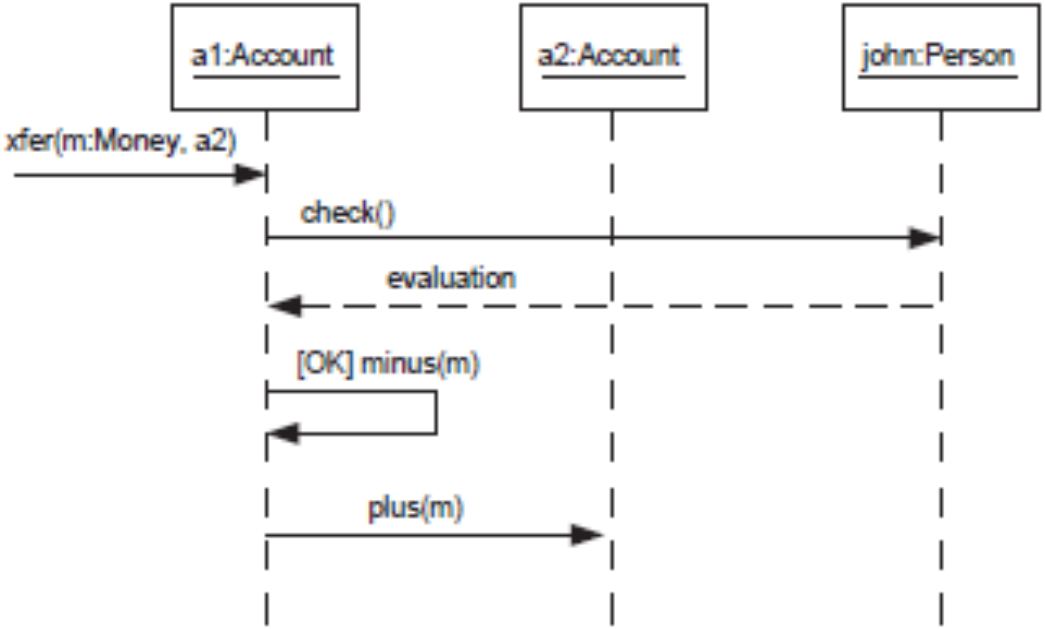

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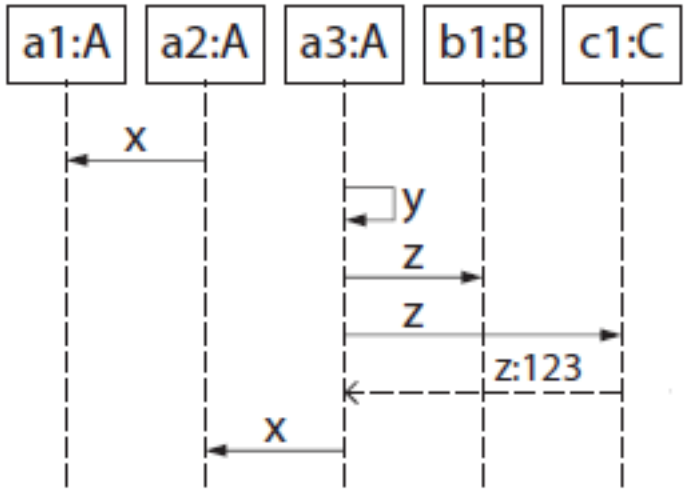
Question

- You are given the following sequence diagram. Which operations does **class B** have according to the diagram?
  1. y():void
  2. x():void
  3. x(String):void
  4. x(void)
  5. x():int
  6. y(int):void
  7. y():int
  8. z():int
  9. x():String
  10. z():void



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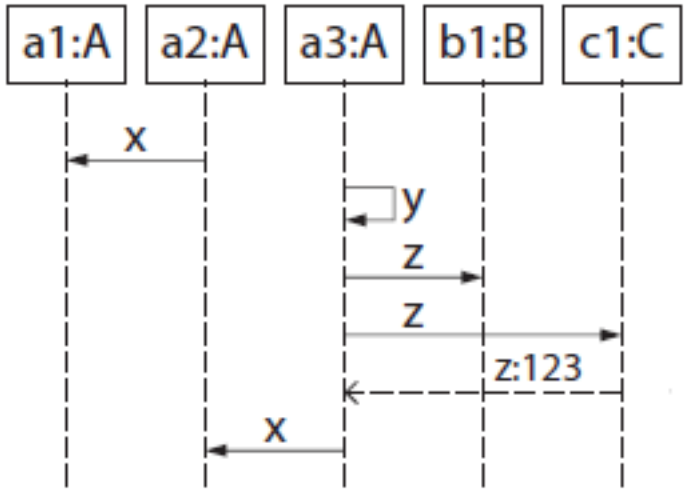
4. x(void)
5. x():int
6. y(int):void
7. y():int
8. z():int
9. x():String
10. **z():void**



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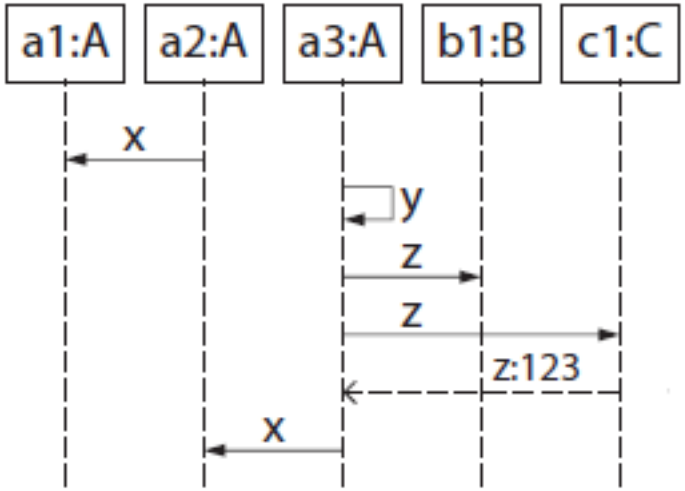
Question

- You are given the following sequence diagram. Which operations does **class C** have according to the diagram?

1. z():int
2. x(void)
3. y(int):void
4. y():int
5. z():void
6. x():int
7. y():void
8. x():void
9. x(String):void
10. x():String



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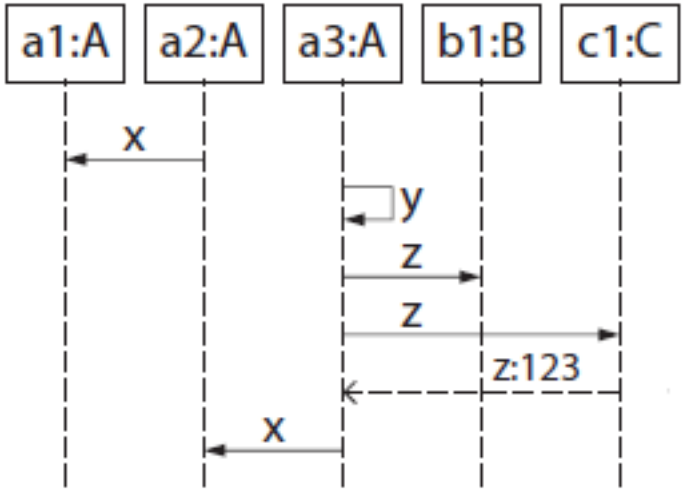
  2. x(void)
  3. y(int):void
  4. y():int
  5. z():void
  6. x():int
  7. y():void
  8. x():void
  9. x(String):void
  10. x():String



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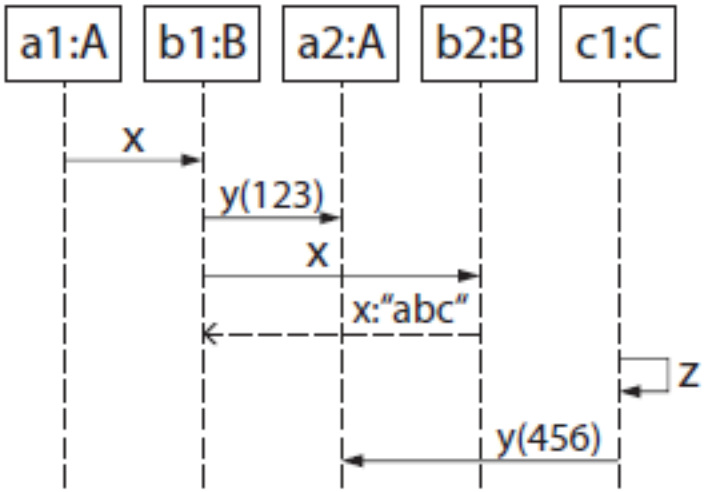
Question

- You are given the following sequence diagram. Which operations does **class A** have according to the diagram?

1. y(int):void
2. x():void
3. z():int
4. y():void
5. x():String
6. x(void)
7. y():int
8. z():void
9. x():int
10. x(String):void



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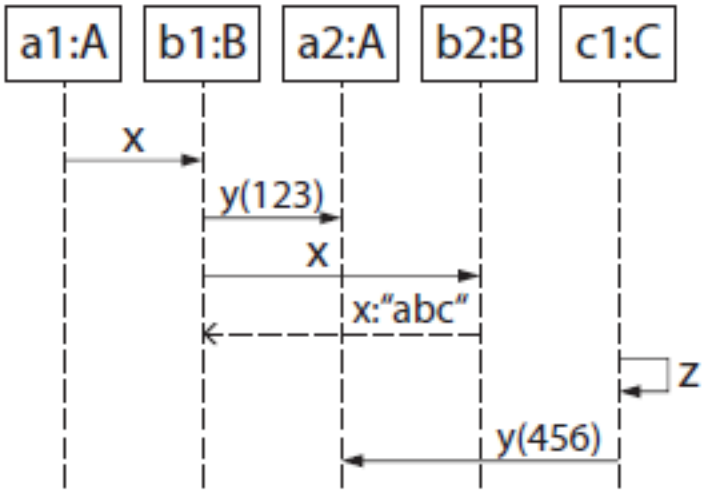

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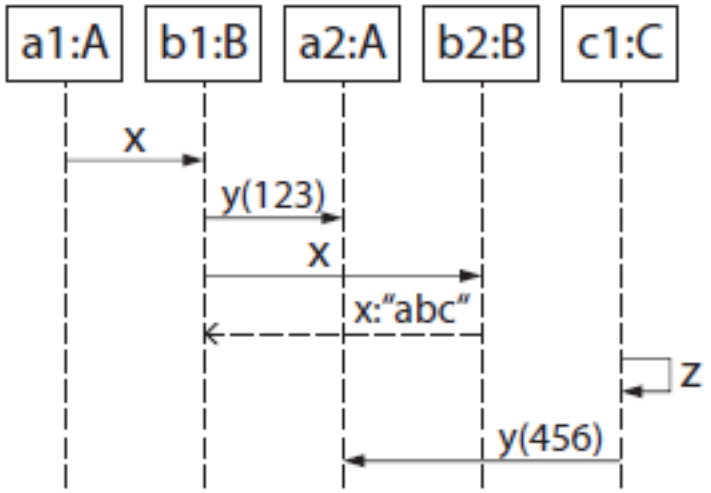
Question

- You are given the following sequence diagram. Which operations does **class B** have according to the diagram?

1. y(int):void
2. z():int
3. z():void
4. x():int
5. x():void
6. x():String
7. x(void)
8. x(String):void
9. y():int
10. y():void



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4. x():int
5. **x():void**
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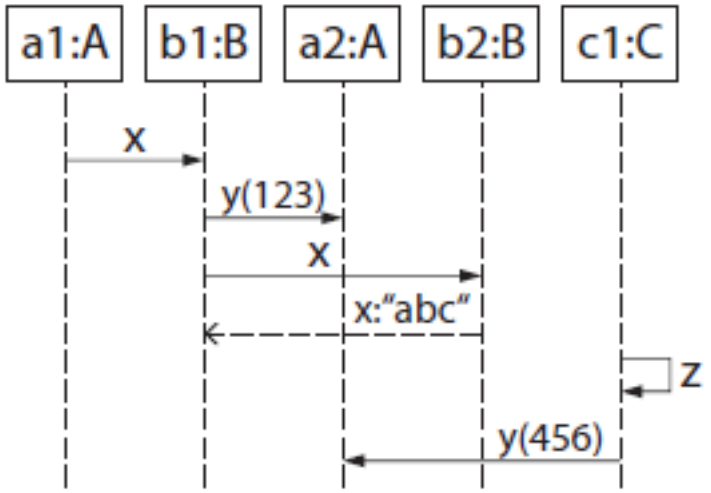
8. x(String):void
9. y():int
10. y():void



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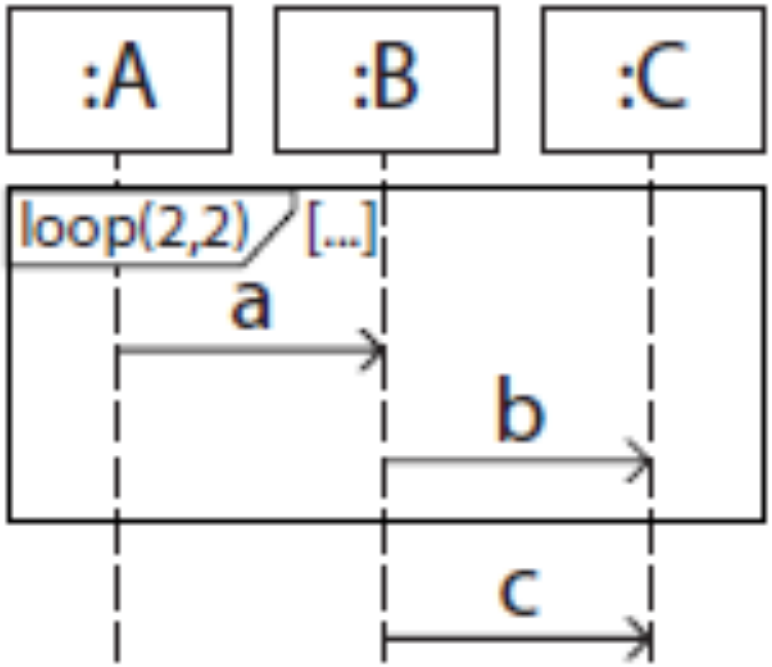
Question

- You are given the following sequence diagram. How are **a**, **b**, and **c** executed?



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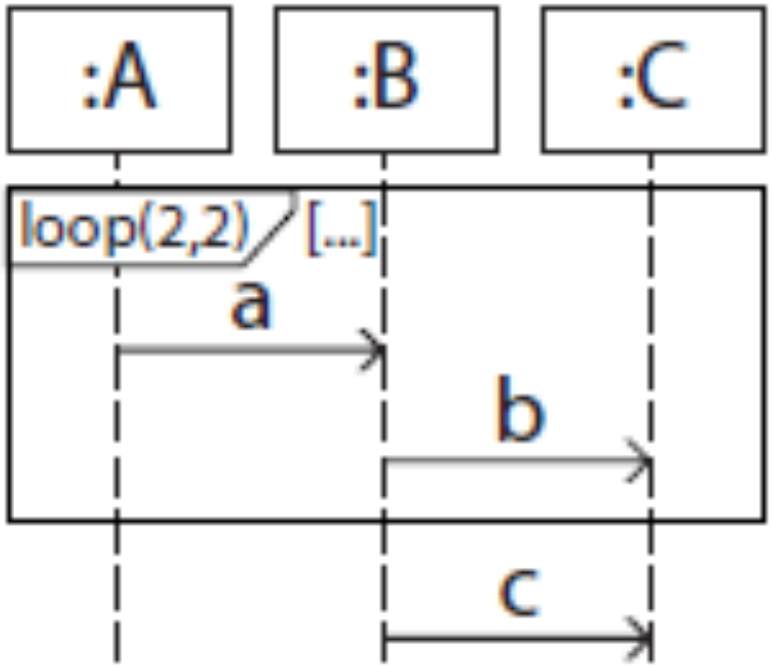
a-b-a-b-c



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Question

Activity Diagram

What actions should be taken in the 'Withdraw Money from ATM' activity?

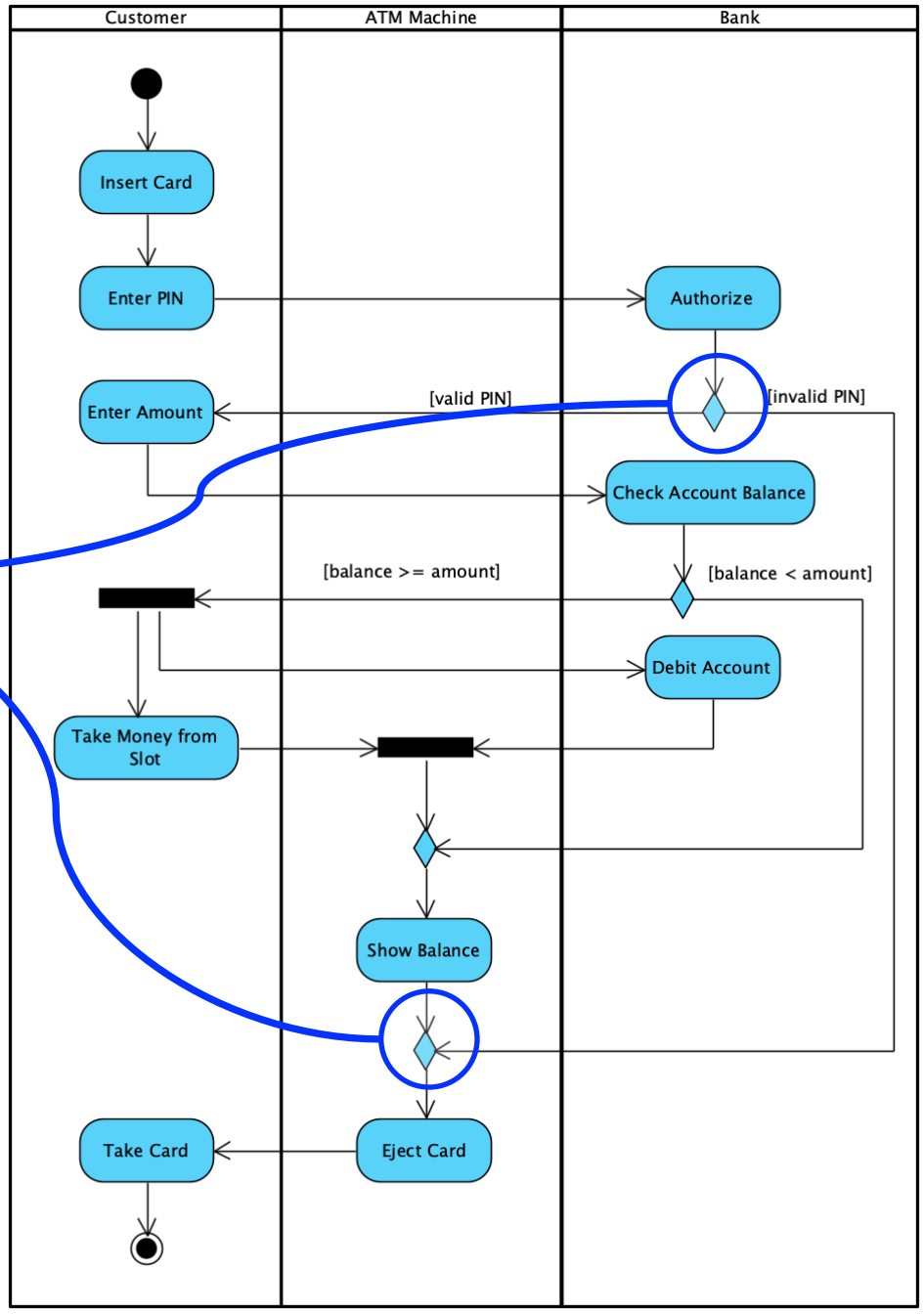
What decisions should be made?

What actions can be performed in parallel?

What units/sections/stakeholders are involved?

Example 1. Withdraw Money from ATM

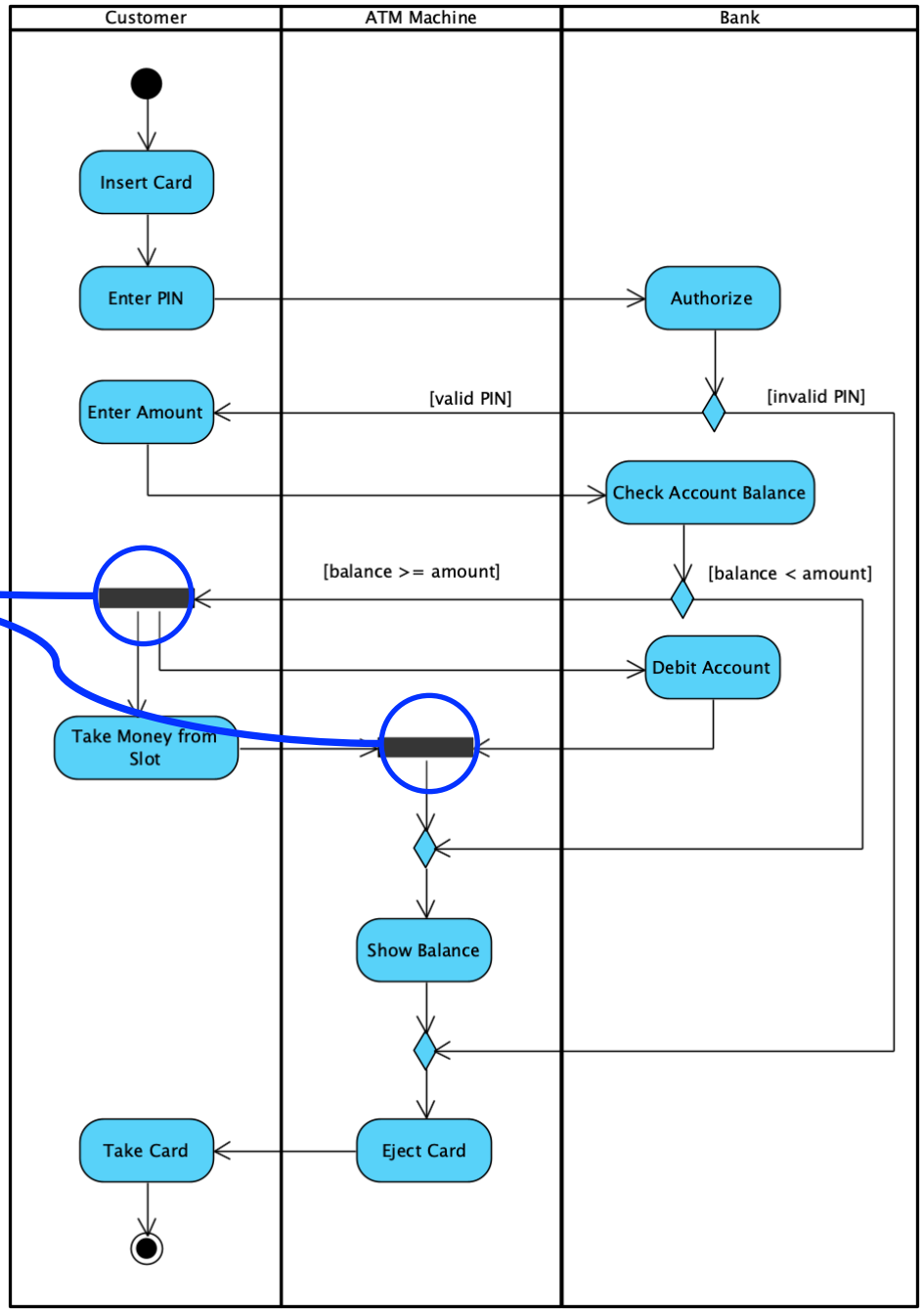
After each decision node, we should have a merge node



*Adopted from existing examples in Visual Paradigm Tool

Example 1. Withdraw Money from ATM

After each fork node, we should have a join node



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Question

Activity Diagram

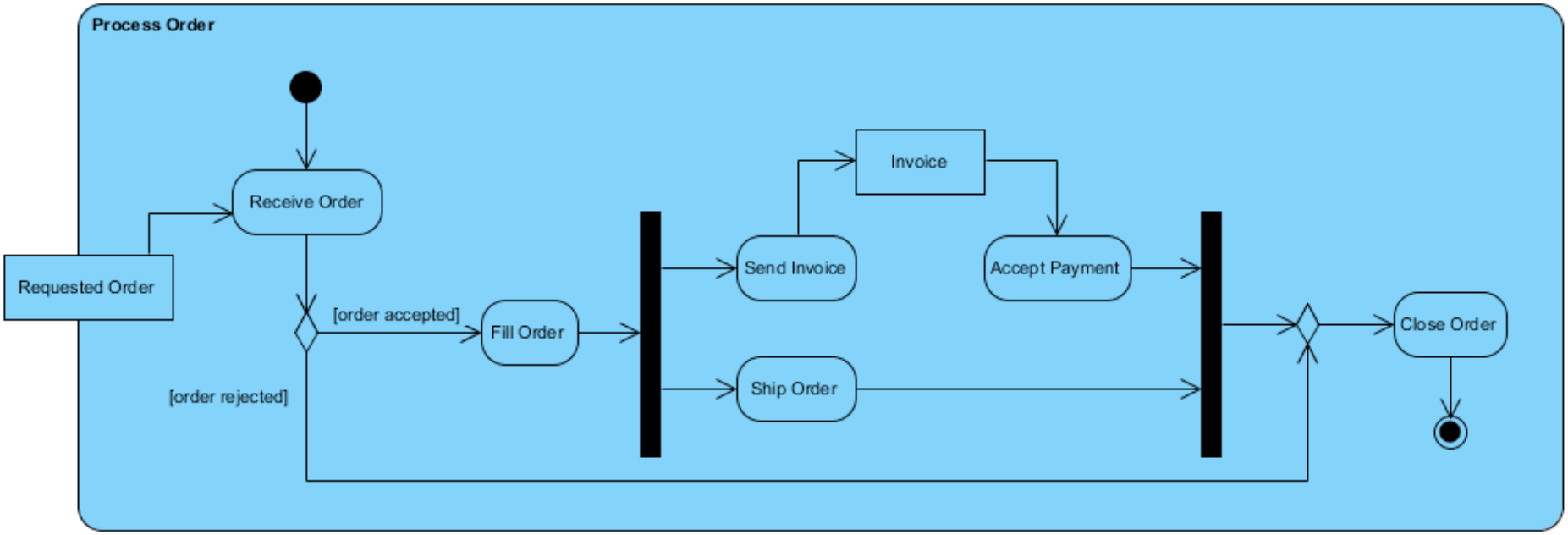
What actions should be taken in the 'Process Order' activity?

What decisions should be made?

What actions can be performed in parallel?

What units/sections/stakeholders are involved?

Example 2. Process Order



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Question

Sequence Diagram

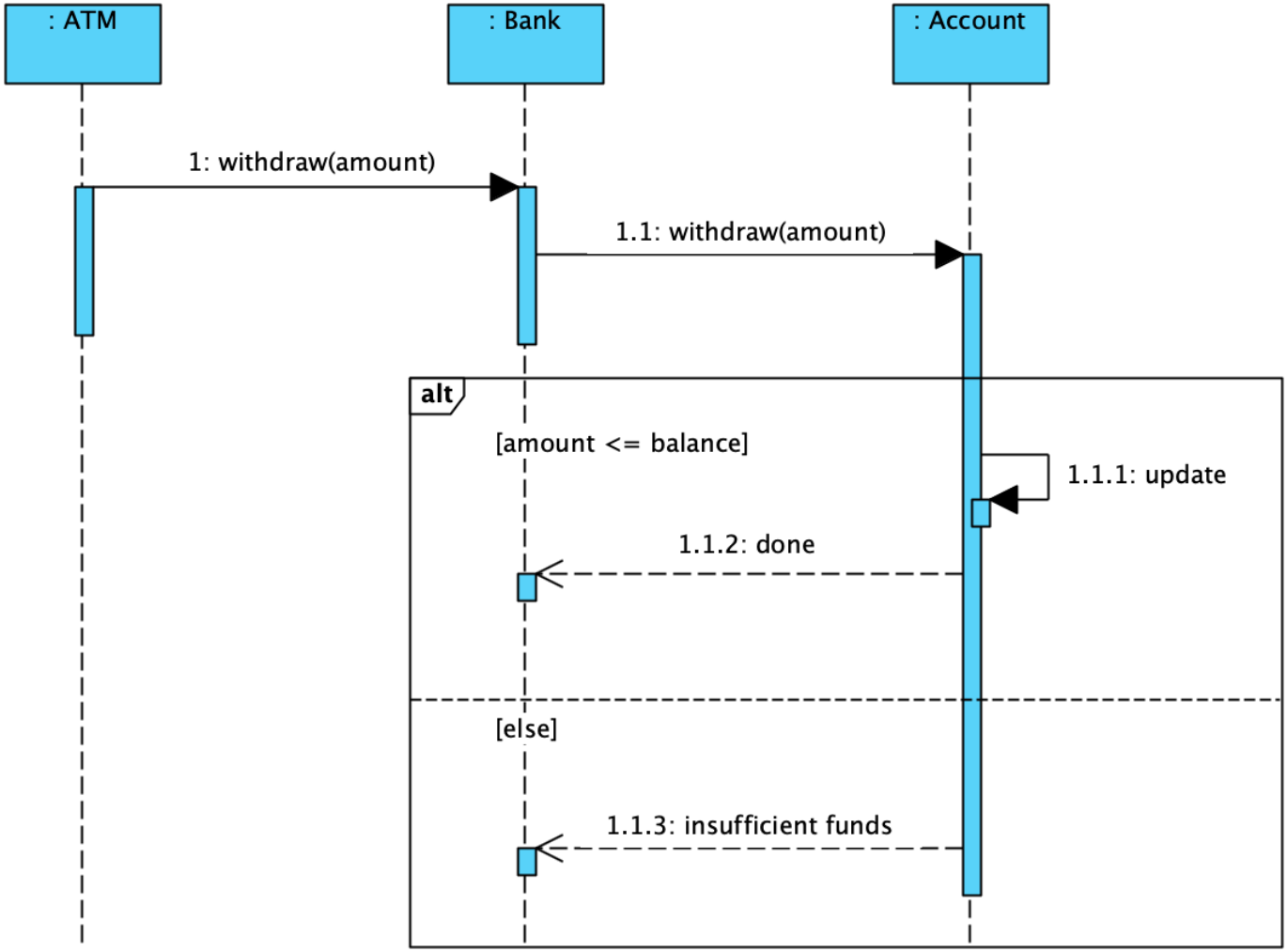
What actions should be taken in the 'Withdraw Money' activity?

What objects are involved?

What decisions should be made?

What information should be transferred between objects?

Example 3. Withdraw Money



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Question

Sequence Diagram

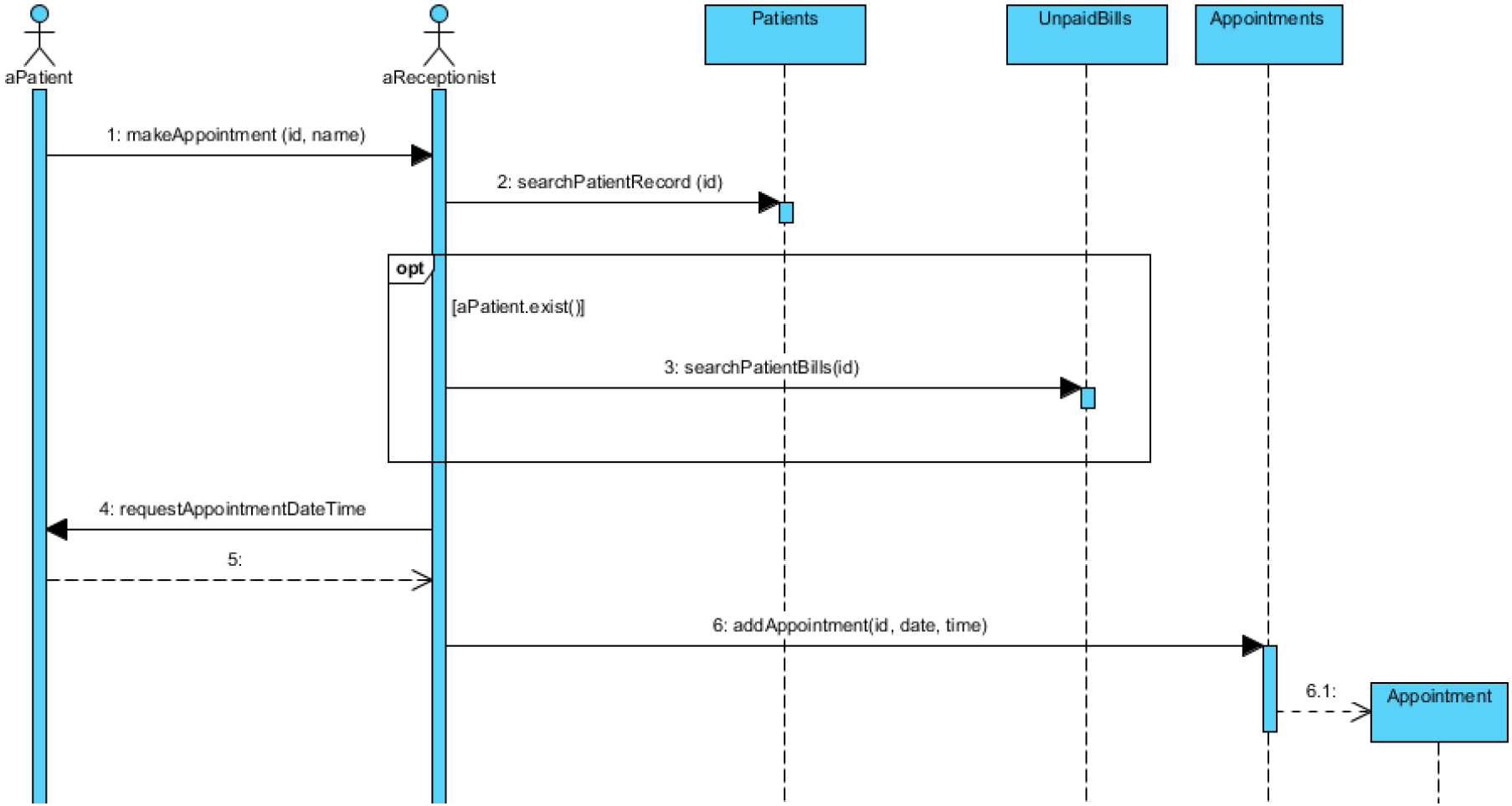
What actions should be taken in the 'Appointment Process' activity?

What objects are involved?

What decisions should be made?

What information should be transferred between objects?

Example 4. Appointment Process



*Adopted from existing examples in Visual Paradigm Tool

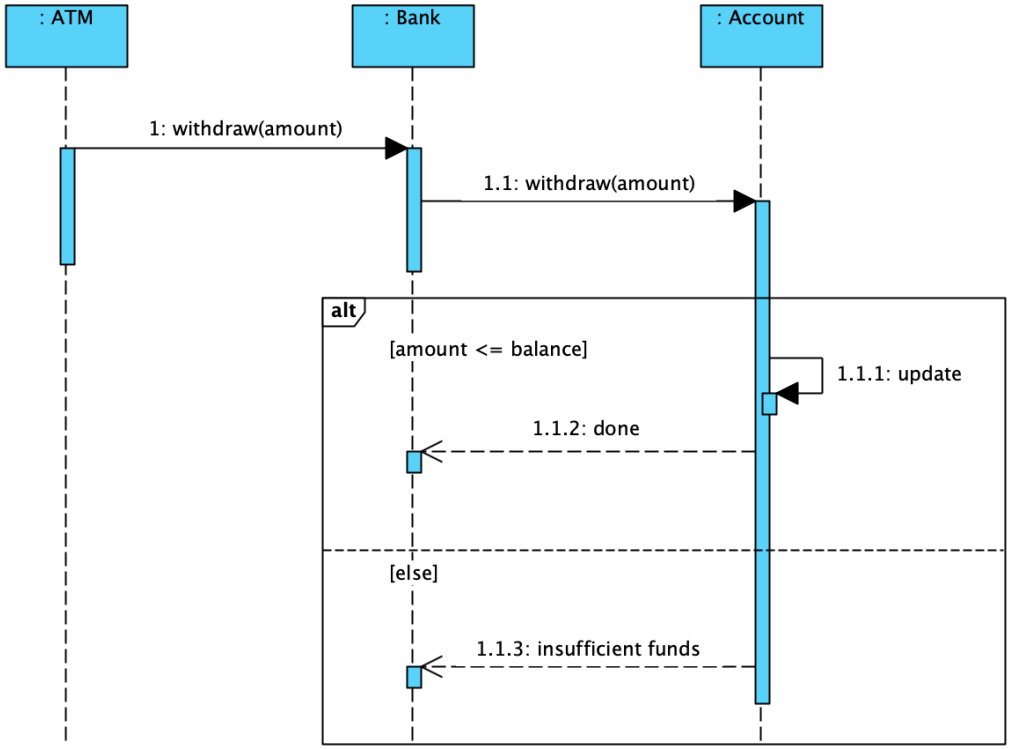
Question

Sequence Diagram: Implementation

'Withdraw Money': Covert Sequence Diagrams into Java Code Skeleton (only for Account class)

Example 5. Withdraw Money

Covert Sequence Diagrams into Java Code Skeleton (only Account class)




```
public class Account {
        private float balance=100;//just an example
        public String withdraw (float amount)
        {
                if (amount <= balance)//code skeleton for 'alt' fragment
                {
                        update();//calling the update function
                        return "Done";
                }
                else
                        return "Insufficient funds";
        }
        public void update()
        {
                // no need to implement this function
        }
}
```

*Adopted from existing examples in Visual Paradigm Tool

Very good reference for UML

- **UML Diagramming: A Case Study Approach** by Sundaramoorthy, Suriya, 2022
  - The book includes several case studies
  - The book includes UML diagrams (use case diagram, class diagram, sequence diagram and activity diagram) for several software systems

Available as an e-book at RMIT Library

References

- http://elearning.uml.ac.at/quiz
- Halil Ali , Software Engineering Fundamentals (Semester 1, 2020), RMIT University, Course Materials on RMIT Canvas
  - Lecture 9 Activity Diagrams

Thanks!

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