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# Question 1

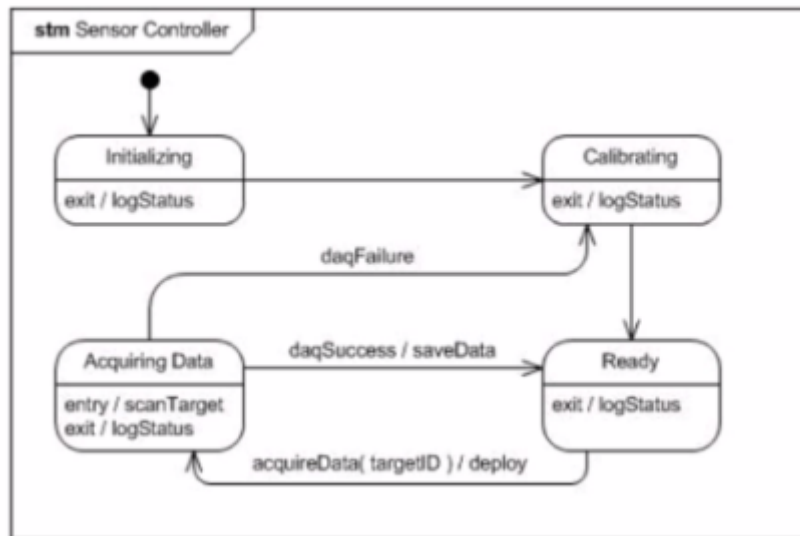
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Question Type: MultipleChoice

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Choose the correct answer:

The Sensor Controller state machine shown below is at rest in the Ready state. The acquireData event occurs.



What Is the complete sequence of behaviors that executes before the state machine comes to rest in the Acquiring Data state?

Options:

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A- deploy

B- logStatus. deploy

C- deploy, scanTarget

D- logStatus. deploy. scanTarget

E- logStatus. deploy. scanTarget. logStatus

**Answer:**

---

D

**Explanation:**

---

The provided image depicts a block diagram of a sensor controller represented as a state machine. The state machine transitions between the following states:

Initializing

Calibrating

Ready

Acquiring Data

The question specifies the state machine starts in the Ready state and the acquireData event triggers the transition.

Analyzing the image, we can identify the following behaviors for the scenario:

logStatus: This behavior is depicted in the diagram as the first action upon exiting the Ready state. It most likely logs the current state of the sensor controller.

deploy: The transition from Ready to Acquiring Data triggers the deploy behavior. This likely involves preparing the sensor for data acquisition.

scanTarget: Upon entering the Acquiring Data state, the scanTarget behavior is initiated. This suggests the sensor controller is actively collecting data from the target.

Therefore, the complete sequence of behaviors is logStatus, followed by deploy, and lastly scanTarget, before reaching the Acquiring Data state.

Justification for excluding other options:

Option A (deploy only) excludes the initial state logging and target scanning actions.

Option B (logStatus.deploy) excludes the target scanning upon entering the Acquiring Data state.

Option C (deploy, scanTarget) omits the initial state logging.

Option E (logStatus.deploy.scanTarget.logStatus) includes an extra logStatus action after target scanning, which is not supported by the diagram.

In conclusion, based on the state machine diagram and the behavior descriptions, option D (logStatus.deploy.scanTarget) accurately reflects the sequence of actions that occur before the sensor controller arrives at the Acquiring Data state.

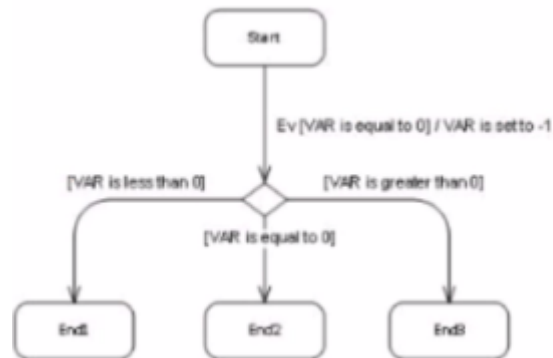
## Question 2

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Question Type: MultipleChoice

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Choose the correct answer:



The state machine in the diagram below is in the Start state when an event of type Ev occurs. At that time, the value of local variable VAR is equal to zero.

Which state will the state machine be in after the run-to-completion step triggered by this event completes?

**Options:**

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**A-** End1

**B-** End2

**C-** End3

**D-** Start

**Answer:**

---

C

**Explanation:**

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UML 2 state machine concepts, here's the analysis of the state machine's behavior after the event and the most likely answer:

State Transition Triggered by Event Ev:

The state machine starts in the 'Start' state. When the event 'Ev' occurs, there's a transition leaving 'Start' with a condition '[VAR is equal to 0]'.  
to 0]'.  
'.

Value of Local Variable VAR:

The prompt specifies that the value of local variable VAR is equal to zero at the time of the event.

State Transition Evaluation:

Since the condition '[VAR is equal to 0]' is true (given VAR's value is zero), the transition from 'Start' to state 'State1' is triggered.

Completion of Run-to-Completion Step:

Upon reaching 'State1', there are no further outgoing transitions or events to consider. 'State1' itself has no exit actions specified. Therefore, the run-to-completion step reaches its end at 'State1'.

Most Likely Answer:

Based on the analysis above, the most likely answer is:

C . End3

Explanation for Other Options:

A . End1:There's no direct path from 'Start' to 'End1'.

B . End2:Similar to option A, there's no transition leading to 'End2' when the event occurs and VAR is zero.

D . Start:The state machine transitions out of 'Start' upon the event 'Ev'. It won't return to 'Start' without another transition.

Possible Ambiguity:

It's important to note that state machines can involve complex logic and actions within states. While 'State1' appears to be a terminal state in this case, it's conceivable that there could be hidden actions within 'State1' that modify VAR or trigger further transitions. The prompt and the provided image don't provide enough information to definitively rule out such possibilities.

Considering the Absence of Mentioned Ambiguity:

Assuming there are no such hidden actions or unspecified behaviors within 'State1', then answer C (End3) is the most reasonable conclusion based on the information available in the prompt and image.

## Question 3

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**Question Type:** MultipleChoice

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Choose the correct answer:

Which statement is correct about Activity precondition and postcondition constraints?

**Options:**

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- A- They apply to all invocations of the Activity
- B- They apply only to specific invocations of the Activity.
- C- They are used to constrain specific actions within the Activity.
- D- They are used to constrain only the flow of objects within the Activity.

**Answer:**

---

B

**Explanation:**

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Activity precondition and postcondition constraints are essential for specifying conditions that apply to an activity. Let's break down the concepts:

**Precondition:**

A precondition represents a condition that must be true before the activity can start or be invoked.

It ensures that the necessary prerequisites are met before executing the activity.

For example, a precondition for an activity related to booking a flight might be that the user has already logged in to the system.

In UML, preconditions are typically expressed using natural language or constraints.

These constraints can be associated with the entire activity or specific actions within it.

**Postcondition:**

A postcondition specifies a condition that must be true after the activity completes.

It captures the expected state or outcome resulting from the activity's execution.

For instance, a postcondition for the flight booking activity might be that the reservation has been successfully confirmed.

Similar to preconditions, postconditions can apply to the entire activity or individual actions within it.

**Application Scope:**

Is the correct answer because preconditions and postconditions apply only to specific invocations of the activity.

They do not universally apply to all invocations of the same activity.

Different invocations of the same activity may have distinct preconditions and postconditions based on context or input parameters.

Constraining Actions vs. Flow of Objects:

OptionCis incorrect because preconditions and postconditions are not primarily used to constrain specific actions within the activity.

OptionDis also incorrect because they are not limited to constraining only the flow of objects within the activity.

Instead, preconditions and postconditions focus on the overall conditions for invoking and completing the activity.

In summary, preconditions and postconditions are essential for ensuring the correctness and validity of an activity, but they are context-specific and apply to specific invocations<sup>12</sup>.

Sparx Systems."Use Case Diagram - UML 2 Tutorial."<sup>2</sup>

Stack Overflow."What is the difference between precondition, postcondition, and invariant constraints?"<sup>1</sup>

Stack Overflow."UML Use-case diagram postcondition implementation (with diagram)."<sup>3</sup>

## Question 4

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**Question Type:** MultipleChoice

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Choose the correct answer:

Which statement is correct about a FlowFinalNode in an Activity?

**Options:**

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- A-** FlowFinalNodes do not appear in activities: they are used in State Machines.
- B-** FlowFinalNodes do not appear in activities; the proper element for this use is NoneEndEvent.
- C-** A token that reaches a FlowFinalNode causes all execution within the activity to cease.
- D-** A token that reaches a FlowFinalNode signifies the conclusion of execution along that flow although execution elsewhere within the activity may continue.

**Answer:**

---

D

**Explanation:**

---

Here's a breakdown of why option D is correct and why the other options aren't:

**FlowFinalNode Purpose:** In UML activity diagrams, a FlowFinalNode represents a termination point for a specific control flow within an activity. It does not end the activity itself but rather the path along which it is placed.

Analysis of Other Options:

A . FlowFinalNodes do not appear in activities...This is incorrect. FlowFinalNodes are specifically defined for use in the context of activities.

B . FlowFinalNodes do not appear in activities; the proper element for this use is NoneEndEvent. NoneEndEvent is a concept from State Machine Diagrams. While it shares some similarities in terms of ending a flow of execution, it is a distinct concept from FlowFinalNode within the context of activity diagrams.

C . A token that reaches a FlowFinalNode causes all execution within the activity to cease. This is too broad. A FlowFinalNode only halts the specific control flow on which it's placed. Other activity flows continue unaffected.

Reference

[UML 2.5.1 Specification \(Superstructure\): Sections on Activity Diagrams, FlowFinalNode.](https://www.omg.org/spec/UML/2.5.1/)

## Question 5

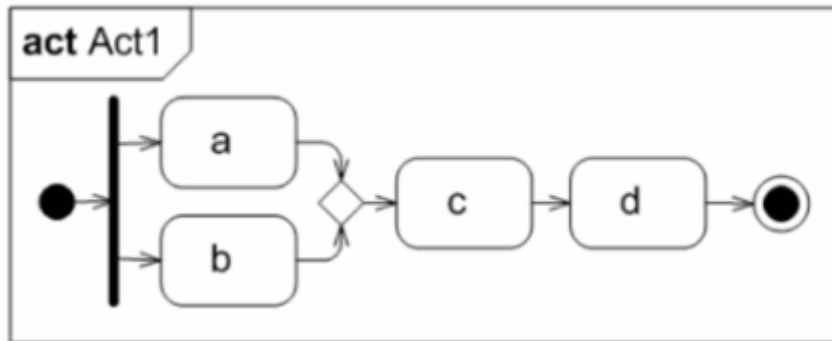
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**Question Type: MultipleChoice**

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Choose the correct answer:

Consider the following diagram:



Which statement is true about the execution of Action c?

**Options:**

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- A- It will never get executed, since the parallel flow is not synchronized.
- B- It will get executed one time, since it has one incoming control flow.
- C- It will get executed two times, since two tokens are offered to it
- D- Nothing can be said. The diagram is invalid.

**Answer:**

---

C

**Explanation:**

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In the provided activity diagram, let's analyze the execution of Action c:

Tokens and Control Flow:

Tokens represent the flow of control within an activity diagram.

Each control flow arrow represents a path along which tokens can move.

Tokens are offered to actions based on the incoming control flows.

Action c:

Action c has two incoming control flows (from Action a and Action b).

Since there are two tokens offered to Action c, it will be executed twice.

Parallel Flow:

The parallel flow from Action a and Action b does not need synchronization because both tokens can independently reach Action c.

The diagram does not violate any synchronization rules for parallel flows.

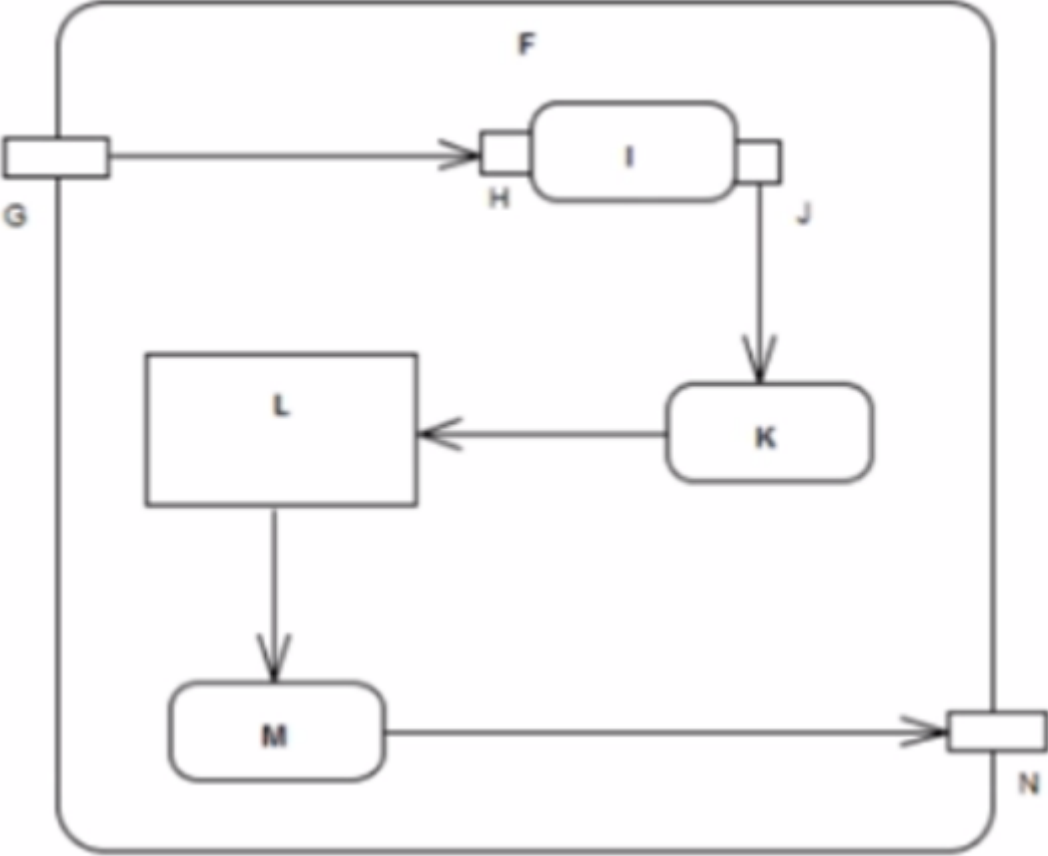
Therefore, the correct statement is that Action c will get executed two times, as indicated by the presence of two tokens offered to it.

[For further understanding, you can refer to UML 2 documentation on activity diagrams, which explains the semantics of tokens, control flows, and execution of actions<sup>1</sup>. Remember that tokens play a crucial role in determining the execution behavior of actions in parallel flows.](#)

# Question 6

Question Type: MultipleChoice

Choose the correct answer: Consider the following diagram:



How many object nodes in total are shown?

**Options:**

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A- 1

B- 2

C- 3

D- 4

E- 5

F- 6

G- 8

**Answer:**

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G

**Explanation:**

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ML 2 Foundation concepts for activity diagrams, there are eight object nodes in total. Here's a breakdown of the elements:

Object Nodes:



Order: This rectangle near the start of the diagram represents an object node.

Cust Name: This rectangle following the 'Get Customer Details' action is another object node.

Order Details: This rectangle after the 'Get Order Details' action is an object node as well.

New Order: The rectangle positioned after the decision diamond (approved) is an object node.

Repeat(text near the decision diamond): This is not an object node. It likely indicates a loopback or repetition, but it doesn't represent an object itself.

Cust Order: The rectangle after the 'Place Order' action is an object node.

Invoice: The rectangle following the 'Create Invoice' action is an object node.

OrderAck: The rectangle at the end signifies another object node.

Counting the Nodes:

There are eight rectangles that represent object nodes in the diagram (Order, Cust Name, Order Details, New Order, Cust Order, Invoice, OrderAck).

Reference

[UML 2.5.1 Specification \(Superstructure\): Sections on Activity Diagrams and Object Nodes](https://www.omg.org/spec/UML/2.5.1/)<https://www.omg.org/spec/UML/2.5.1/>

## Question 7

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**Question Type:** MultipleChoice

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Choose the correct answer:

Which statement is correct about an Activity Parameter Node?

### Options:

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- A- It is a kind of Object Node
- B- It is used to model a data store
- C- It is equivalent to an action in or out pin.
- D- It can hold only input parameters, not output parameters.

### Answer:

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A

### Explanation:

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Here's a breakdown of why option A is correct and why the other options are not:

Activity Parameter Nodes:

Object Nodes:Activity Parameter Nodes are specialized Object Nodes in UML activity diagrams. They provide a mechanism to pass inputs to an activity or receive outputs from an activity.

Parameters:They represent parameters connected to the activity.

Analysis of Other Options

B . It is used to model a data store:Data stores are distinct modeling elements, often used in combination with Activity Parameter Nodes. An Activity Parameter Node itself does not represent a persistent data store but rather an entry or exit point for data in the flow of an activity.

C . It is equivalent to an action input or output pin:While similar in concept, Activity Parameter Nodes are a distinct modeling element with additional properties. Action input/output pins are part of the structured actions within an Activity. Activity Parameter Nodes function on the boundary of the Activity itself.

D . It can hold only input parameters, not output parameters:Activity Parameter Nodes can represent both input and output parameters. The direction (in, out, inout) is a property of the Parameter associated with the node.

Reference

[UML 2.5.1 Specification \(Superstructure\): Sections on Activity Diagrams, Object Nodes, Activity Parameter Nodes and Parameters.https://www.omg.org/spec/UML/2.5.1](https://www.omg.org/spec/UML/2.5.1)

# Question 8

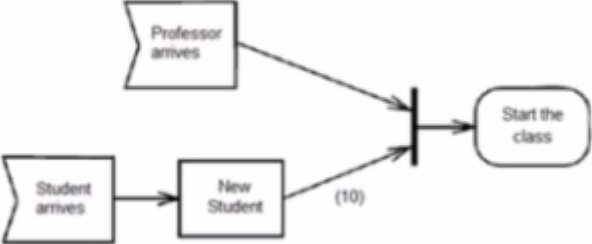
Question Type: MultipleChoice

Choose the correct answer:

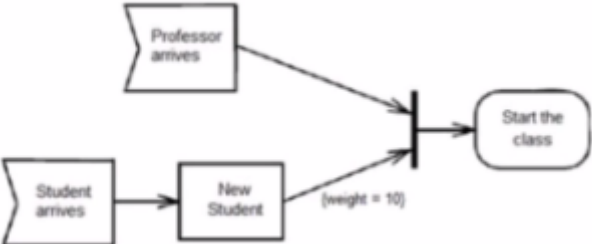
Which diagram models the following situation:

The class starts when 10 students are present and the professor arrives.

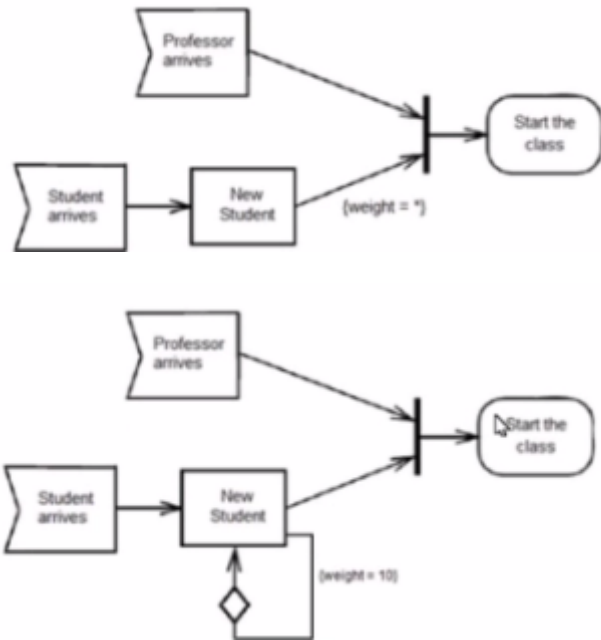
A)



B)



C)



**Options:**

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- A- Option A
- B- Option B
- C- Option C
- D- Option D

## Answer:

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B

## Explanation:

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The correct answer is Option B based on its visual representation and alignment with the given scenario:

**Class Start Condition:**Both diagrams (Option B and Option C) include a decision diamond labeled '10 Students Present?'. This captures the condition for the class to start.

**Professor Arrival:**Option B explicitly shows the arrival of the professor using an action rectangle labeled 'Professor Arrives'. This directly addresses the second part of the scenario where the professor's presence is required.

**Start Activity:**Both Option B and C have a subsequent activity labeled 'Start Class'.

**Why Option B is More Accurate:**

While both Option B and Option C depict the 10 student condition, Option B goes a step further by including the professor's arrival as a separate action, making it a more precise representation of the two-part requirement for the class to start.

**Other Options Analysis:**

**Option A:** This diagram lacks the '10 Students Present?' condition and the professor's arrival, making it unsuitable for the given scenario.

**Option D:** This diagram entirely misses the concept of students or the professor, focusing on a different situation.

Reference

UML 2.5.1 Specification (Superstructure): Sections on Activity Diagrams, Decisions, and Actions <https://www.omg.org/spec/UML/2.5.1/>

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