



Certified LabVIEW Associate Developer Exam

Test Booklet

Note: The use of the computer or any reference materials is NOT allowed during the exam.

Instructions:

If you did not receive this exam in a sealed envelope stamped "NI Certification," **DO NOT ACCEPT** this exam. Return it to the proctor immediately. You will be provided with a replacement exam.

- **Please do not detach the binding staple of any section. If any part of the exam paper is missing or detached when returned to National Instruments, you will be deemed to have failed the exam.**
- Please do not ask the proctor for help. If you believe the intent of a question is not clear, you may note that question, and your reasons for choosing the answer you believe best fits the question.
- This examination may not be taken from the examination area or reproduced in any way. You may not keep any portion of this exam after you have completed it.

Exam Details:

- Time allocated: 1 hour
- Type of exam items: Multiple choice
- Number of exam items: 40 questions
- Passing Grade: 70%

IMPORTANT: When you have completed this exam, place it in the provided envelope with you answer sheet and SEAL the envelope. Give the sealed envelope to your proctor.

Answer Sheet:

To quickly check your answers against the solutions in the Solutions Section, record your answers on this Answers Sheet. Detach this page and record your answers as you go along. This page is not included in the actual CLAD exam; it is included here for practice purposes only. The Solutions Section is at the end of the Sample Exam.

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40. _____

Sample CLAD Exam

Sample Exam Items:

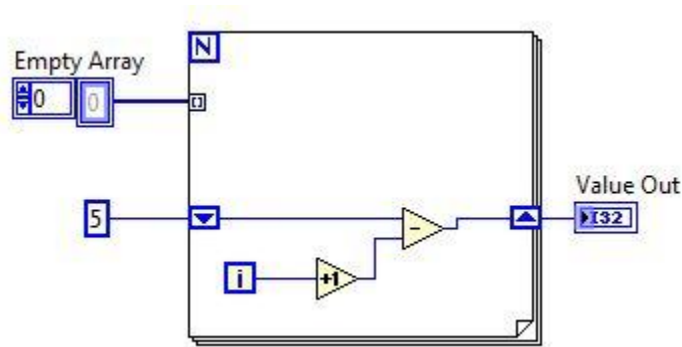
1. For implementing state diagrams that allow future application scalability, the best choice for a base structure is?
 - a. Sequence structure
 - b. Case structure
 - c. Formula node
 - d. Object-Oriented structure

2. Clicking on the _____ button allows you to bypass a node in the Block Diagram without single-stepping through the node.
 - a. Step Into
 - b. Step Over
 - c. Step Out
 - d. Step Through

3. Which of the following apply to Property Nodes? **(More than one answer may apply.)**
 - a. Property Nodes allow attributes of front panel objects to be programmatically manipulated.
 - b. Property Nodes can be used to update the values contained in a front panel object.
 - c. More than one Property Node can be used for a single front panel object.
 - d. Property Nodes can be used to programmatically generate a Value Change event.

4. You have a front panel control on a top-level VI that you must control from within a subVI. What must you pass to the subVI?
 - a. The control's properties
 - b. The control's methods
 - c. The control's reference
 - d. The control's data type

5. What value does the **Value Out** indicator display after the VI executes?



- a. 0
 - b. 4
 - c. 5
 - d. 6
6. You set a Breakpoint in the code contained within the False case of a Case structure. Will the VI execution pause if the code in True case of the Case structure is being executed?
- a. Yes
 - b. No
7. Which Property Node changes the text color attributes of any digital numeric control from a subVI?

- a.

Property node for **DigNum (strict)**. It has two property nodes: **NumText.BGColor** (red square) and **NumText.TextColor** (black square).
- b.

Property node for **DigNum**. It has two property nodes: **NumText.BGColor** (red square) and **NumText.TextColor** (black square).
- c.

Property node for **DigNum**. It has two property nodes: **NumText.BGColor** (red square) and **NumText.TextColor** (black square).
- d.

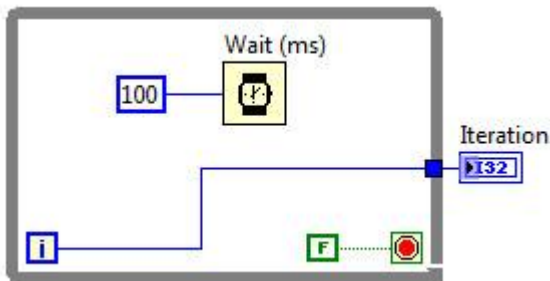
Property node for **Num**. It has two property nodes: **UnitLabel.BGColor** (red square) and **UnitLabel.TextColor** (black square).

8. Which chart update mode should be used to show running data continuously scrolling from left to right across the chart?
 - a. Strip Chart
 - b. Scope Chart
 - c. Sweep Chart
 - d. Step Chart

9. Which of the following does not conform to the Dataflow programming paradigm?
 - a. Shift Registers
 - b. Tunnels
 - c. SubVIs
 - d. Local variables

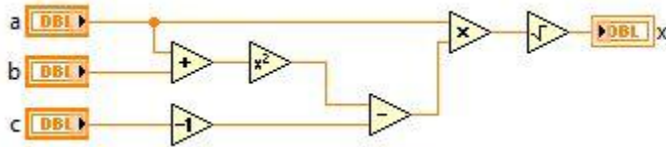
10. If possible, a Sequence structure should be replaced with a(n):
 - a. Event structure
 - b. For loop
 - c. State machine
 - d. While loop

11. Which of the following statements is **TRUE** about the following code segment?



- a. The loop will execute once and the indicator Iteration will have a value of one
- b. The loop will execute once and the indicator Iteration will have a value of zero
- c. The loop will execute infinitely and the program will have to be aborted
- d. The loop will not execute and the indicator Iteration will have a value of zero

12. Which equation is equivalent to the code?



a.
$$x = \sqrt{a \times ((a + b)^2 - (c - 1))}$$

a.

b.
$$x = \sqrt{a \times ((c - 1) - (a + b)^2)}$$

b.

c.
$$x = \sqrt{a \times ((a + b^2) - (c - 1))}$$

c.

d.
$$x = \sqrt{a^2 \times ((a + b)^2 - (c - 1))}$$

d.

13. A VI has Automatic Error Handling enabled. It calls a SubVI that has Automatic Error Handling disabled. The Error Out terminal of the SubVI is unwired in the calling VI. The SubVI returns an error to the calling VI. Will an error dialog be posted because of Automatic Error Handling?

- a. No, since the SubVI has Automatic Error Handling disabled
- b. Yes, since the SubVI has Automatic Error Handling disabled
- c. No, since the Error Out terminal from the subVI is not wired in the calling VI.
- d. Yes, since the Error Out terminal from the subVI is not wired in the calling VI.

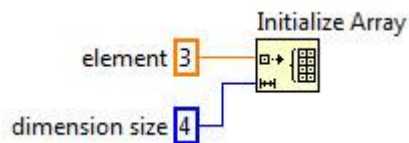
14. Which of the following statements is **FALSE**?

- a. A SubVI connector pane defines where to wire inputs and outputs
- b. The color of a SubVI connector pane terminal matches the data type it is connected to
- c. You must have an icon/connector pane to use a SubVI
- d. A SubVI icon can be edited from the functions palette

15. Which of the following cannot be used to transfer data?

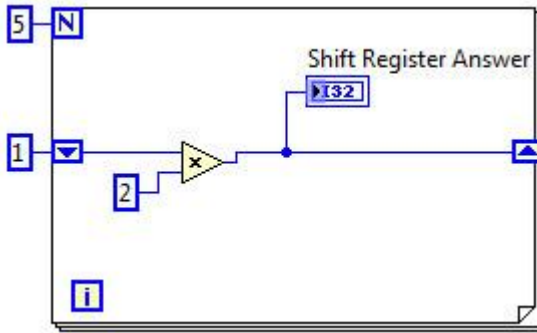
- a. Semaphores
- b. Queues
- c. Notifiers
- d. Local variables

16. The Error list shows all of the following **EXCEPT**:
- Items with errors
 - Errors and warnings
 - Details about the warnings
 - Error Codes
17. Auto-indexing at loop boundary is a feature that allows: **(More than one answer may apply.)**
- Arrays to be automatically traversed from one iteration to the next
 - Array functions to automatically index array elements
 - Functions that use arrays to automatically index them
 - Arrays to be automatically accumulated at loop boundaries
18. What is the output of the Initialize Array function after the following code has executed?



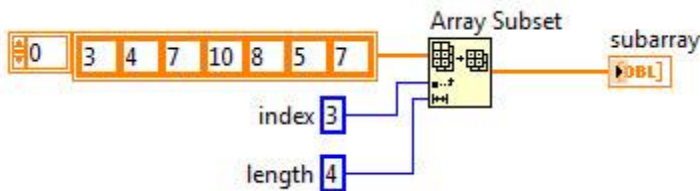
- 1-D Array of {3, 3, 3, 3}
 - 1-D Array of {4, 4, 4}
 - 1-D Array of {3, 4}
 - 1-D Array of {4, 3}
19. Which of the following will cause an event to be captured by the LabVIEW Event Structure?
- Changing a Front Panel control's Value via a mouse click on the control
 - Changing a Front Panel control's Value property via a property node
 - Changing a Front Panel control's Value via a control reference
 - Changing a Front Panel control's Value via a local variable
20. Which variable is commonly used to eliminate race conditions by preventing simultaneous access to code or data?
- Functional global variable
 - Local variable
 - Global variable
 - Shared variable

21. What is the value in **Shift Register Answer** after the following code has executed?



- a. 16
- b. 24
- c. 32
- d. 10

22. What is the result in **subarray** after the following code has executed?



- a. 1-D Array of {8, 5, 7}
- b. 1-D Array of {10, 8, 5}
- c. 1-D Array of {10, 8, 5, 7}
- d. 1-D Array of {7, 10, 8, 5}

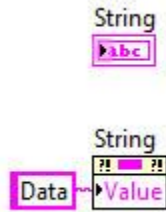
23. How do you document a VI so that the description appears in the Show Context Help popup window?

- a. Use the VI Properties Documentation window
- b. Type in the Show Context Help window
- c. Create a free label on the front panel
- d. Edit the LabVIEW help files

24. Which of the following terminals controls how many times a For loop executes?

- a.
- b.
- c.
- d.

25. Does this code snippet demonstrate an appropriate use of a Property Node?



- Yes, because updating the value via a Property Node uses less memory than writing to the terminal
- Yes, because updating the value via a Property Node allows for error checking
- No, because you should always wire data directly into indicators when possible
- No, because Property Nodes should only be used with more complex data types

26. The Wait Until Next ms Multiple function:

- Begins timing at program start and completes upon a multiple of the PC timer
- Begins timing after the code in the loop has completed and expires when the multiple of the (user) input time expires
- Begins timing after the code in the loop has completed and expires when the (user) input time completes
- Begins timing at program start and waits until the code in the loop has completed

27. Which data synchronization mechanism ensures that no data is lost when an application temporarily provides data faster than it is able to process it?

- Notifier
- Queue
- Semaphore
- Local Variable

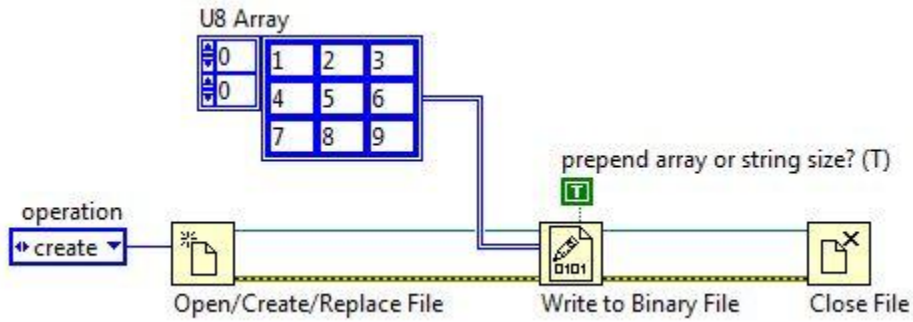
28. Which of the following statements is NOT valid:

- You can make a Cluster of Clusters.
- You can make an Array of Arrays.
- You can make a Cluster of Arrays.
- You can make an Array of Clusters.

29. Which data type is not accepted by the case selector terminal on a case structure?

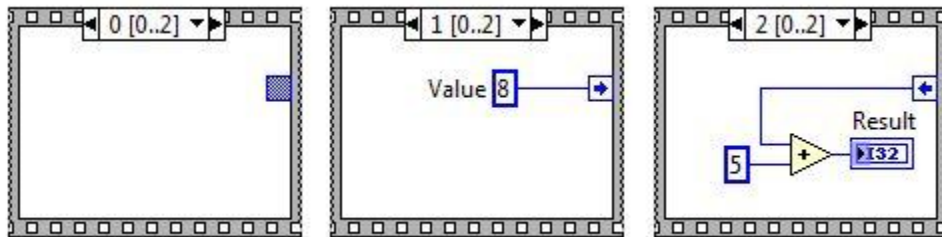
- Arrays
- Enumerated type values
- Strings
- Integers

30. How many bytes does LabVIEW write to the file when the code executes?



- a. 9 Bytes
- b. 11 Bytes
- c. 13 Bytes
- d. 17 Bytes

31. Why is the sequence local terminal displayed as unassigned in Frame 0 of the stacked sequence structure?



- a. The developer chose not to wire the value to any terminal in this frame
- b. The value is available only to frames after frame 1
- c. The data type of the terminal is incompatible with the data type of Value
- d. The developer disabled the terminal

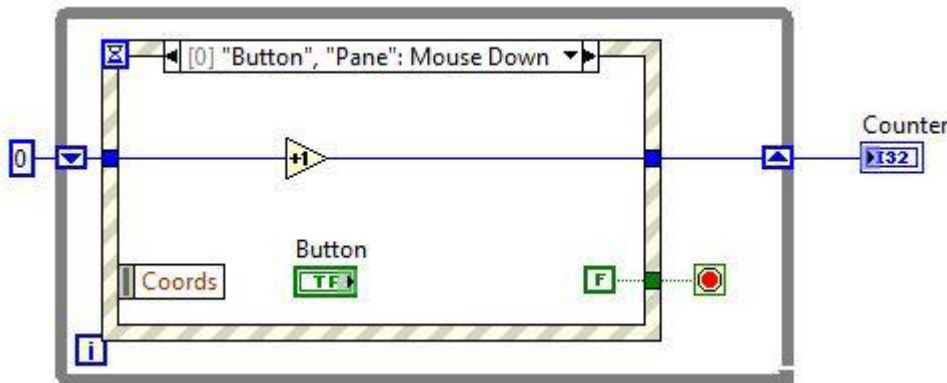
32. The Wait function can be added to While Loops:

- a. To free up available memory.
- b. To allocate memory used by the CPU.
- c. To allow the processor time to complete other tasks.
- d. To reserve which processor the code is running on.

33. The data type of a Ring can be any of the allowable data types, whereas the numerical representation of the data type of an Enum can only be of unsigned data type.

- a. True
- b. False

34. When the user clicks the **Button** control, how many times is the **Increment** function called?

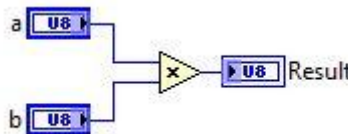


- a. 0
- b. 1
- c. 2
- d. 3

35. Why is LabVIEW a data flow programming language?

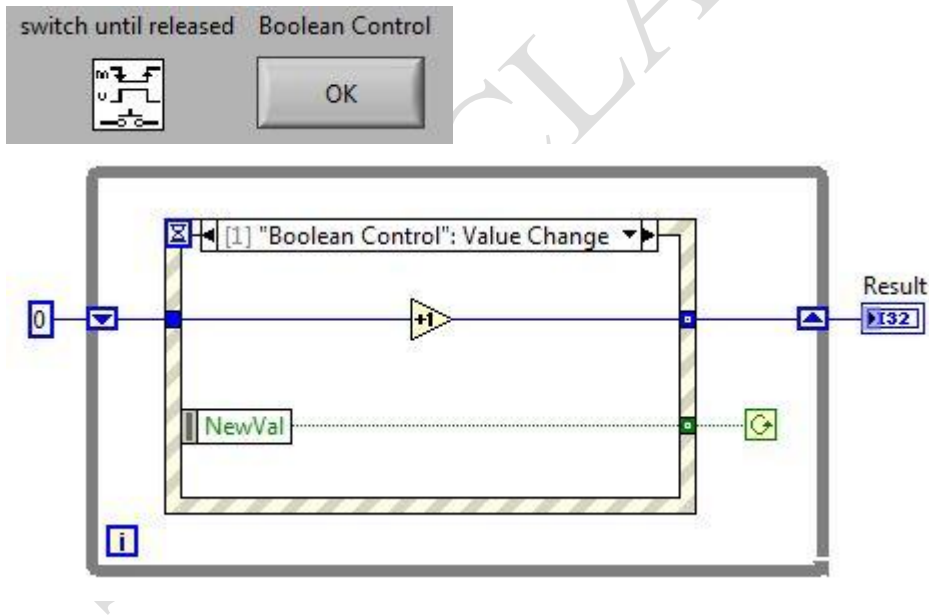
- a. It uses icons instead of text to create applications
- b. The flow of data through nodes on the block diagram determines execution
- c. It does not have a Goto function to control execution
- d. The memory location in which data is stored changes each iteration

36. If the value in **a** is 2 and **b** is 128, what value does the **Result** indicator display after the VI executes?



- a. -128
- b. 0
- c. 255
- d. 256

37. What VI is typically used to terminate an Error Cluster wire and to display any error message?
- Merge Errors
 - One Button Dialog/Two Button Dialog
 - Generate Front Panel Activity
 - Simple Error Handler
38. Which of the following methods will create an XY Graph with two plots?
- Create a single cluster from two arrays of X values and two arrays of Y values in an X,Y, X,Y pattern.
 - Bundle the X and Y array pairs together into two clusters and then create an array of these two clusters.
 - Bundle the X and Y array pairs together into two clusters and create a cluster of these two clusters.
 - Create a single array of each of the X arrays and Y arrays in an X,Y,X,Y pattern.
39. While the VI executes, the user presses and then releases **Boolean Control** with Switch Until Released mechanical action. Assuming that the starting value of **Boolean Control** is FALSE, what value does the **Result** indicator display after execution?



- 0
- 1
- 2
- 3

40. Which of the following is the best method to update an indicator on the front panel?
- a. Use a Value property node
 - b. Wire directly to the indicator terminal
 - c. Use a local variable
 - d. Use a functional global variable

Sample CLAD Exam

Solutions Page:

Below are the answers and links to additional resources for the CLAD Sample Exam. All of the references listed are articles in *LabVIEW 2011 Help*. To quickly check your answers, record them on the Answer Sheet, detach the Answer Sheet, and compare it, side-by-side, with the Solutions Page. This answer page is not included in the actual CLAD exam; it is included here for practice purposes only.

1. **Correct Answer:** B
Topic: Design Patterns
Justification: In LabVIEW, simple state machines consist of a While Loop containing a case structure. The case structure allows the decision of which case to run to be determined programmatically. It is also scalable since it is easy to add new cases to the case structure.
References: *Creating VIs from Templates, Case Structure*
2. **Correct Answer:** B
Topic: Debugging
Justification: Clicking the Step Into button causes LabVIEW to open up the node or subVI. The Step Out button is used to return from a subVI to a main VI while single-stepping. There is no Step Through button. Step Over provides the functionality stated by the question, therefore this is the correct answer.
References: *Single-Stepping through a VI*
3. **Correct Answer:** A, B, C, D
Topic: Property Nodes
Justification: All of the statements are true for Property Nodes.
References: *Property Node*
4. **Correct Answer:** C
Topic: VI Server
Justification: The only answer option that can be passed from calling VI to subVI is the control reference. The reference can then be used with Property Nodes and Invoke Nodes to call properties and methods, respectively. The data type is a property of the control.
References: *Controlling Front Panel Objects Programmatically from a SubVI, VI Server Reference*
5. **Correct Answer:** C
Topic: Loops
Justification: An empty array is wired to the For Loop using an auto-indexing tunnel. This causes the For Loop to iterate once for every element in the array, which, in this case, is zero. However, the value 5 is written to the shift register before loop execution, and since the loop iterates zero times, the same value of 5 is present at the output shift register.
References: *For Loop, Passing Multiple Values to the Next Loop Iteration, Using Shift Registers to Remember Iteration Values* (Topic of the LabVIEW 2010 Help)

6. **Correct Answer:** B
Topic: Debugging
Justification: Code containing breakpoints executes like normal until data is passed on a wire that contains a breakpoint. Then, LabVIEW suspends execution. In order for the breakpoint to activate, the section of code containing it must be called. With a Case structure, only one case executes each time it is called. Since, in this case, the case containing the breakpoint was not called, the execution was not paused.
References: *Managing Breakpoints*
7. **Correct Answer:** B
Topic: VI Server
Justification: Strict property nodes require precise knowledge of the numeric representation. Since the question asks for the means to change the text color of any control, a strict Property Node does not suffice. An implicit Property Node (C), can only be used locally. Answer D shows a property that is not even relevant to the question. Thus, option B is the best answer.
References: *Switching Between Strictly Typed and Weakly Typed Control Refnums, Property Nodes*
8. **Correct Answer:** A
Topic: Charts and Graphs
Justification: Strip charts start plotting from left to right and continue to scroll while plotting. Scope charts start plotting from left to right and continue until the chart is full. Then the chart is cleared, and plotting resumes at the left. Sweep charts behave similarly to scope charts, except that once the chart is full, sweep charts start plotting at the left and progressively overwrite previously plotted data. There is no such thing as a Step chart in LabVIEW.
References: *Customizing Graphs and Charts*
9. **Correct Answer:** D
Topic: Local Variables
Justification: Local variables do not conform to the Dataflow paradigm because they communicate by reference, not by value. The basic premise of local variables is to allow transfer of data where it is impossible to use wires. This circumvents the Dataflow paradigm.
References: *Block Diagram Data Flow, Local Variables, Using Local and Global Variables Carefully*
10. **Correct Answer:** C
Topic: Design Patterns
Justification: A state machine can be used to achieve the same functionality as a sequence structure. However, state machines allow the developer to programmatically determine the sequence at run-time. This makes the state machine implementation more scalable.
References: *Case and Sequence Structures*
11. **Correct Answer:** C
Topic: Loops
Justification: The While Loop has a FALSE Boolean wired to its conditional terminal, which is set to Stop if TRUE. Thus, there is no condition that causes this While Loop to stop. So, the While Loop could run infinitely and the VI must be aborted.
References: *For Loop and While Loop Structures, While Loop*

12. **Correct Answer:** A
Topic: LabVIEW Programming Principles
Justification: Because LabVIEW is a Dataflow language, we can trace the flow of data in the block diagram to see which operations execute first, second, and so forth.
References: *Block Diagram Data Flow*
13. **Correct Answer:** D
Topic: Error Handling
Justification: Since automatic error handling is enabled in the main VI, and the error terminals of the subVI are not wired, LabVIEW automatically handles the error by displaying a dialog.
References: *Handling Errors*
14. **Correct Answer:** D
Topic: LabVIEW Environment
Justification: Icons cannot be edited from the functions palette. SubVI icons can be edited by right-clicking the icon in the upper right of the VI and selecting **Edit Icon**.
References: *Creating a VI Icon*
15. **Correct Answer:** A
Topic: Synchronization and Communication
Justification: Queues, notifiers, and local variables are all designed to transfer data. Semaphores do not pass data. Instead, their sole purpose is to prevent certain sections of code from running while other critical sections are running.
References: *Synchronization VIs and Functions*
16. **Correct Answer:** D
Topic: LabVIEW Environment
Justification: You must either look at an output error cluster or an error dialog to find the error code.
References: *Error List Window*
17. **Correct Answer:** A, D
Topic: Arrays and Clusters
Justification: Auto-indexing is a feature for loops interacting with arrays. Array functions themselves do not have iterative auto-indexing features.
References: *For Loop and While Loop Structures, Passing Elements in an Array through a Loop, Enabling Auto-Indexing for Loops* (Topic of the LabVIEW 2010 Help)
18. **Correct Answer:** A
Topic: Arrays and Clusters
Justification: The Initialize Array function creates an array with a length specified by dimension size. The value of each element is specified by the element input. To initialize multidimensional arrays, you can simply expand the Initialize Array function to display more dimension size inputs.
References: *Initialize Array Function*

19. **Correct Answer:** A
Topic: Event Structures
Justification: Each possible answer refers to a Value Change event. Value Change events are either generated by user interaction on the front panel, or by calling a Value (Signaling) Property Node. Calling a Value Property Node does not generate an event.
References: *Available Events, Using Events in LabVIEW*
20. **Correct Answer:** A
Topic: Functional Global Variables
Justification: You can place critical data or sections of code in functional global variables. Since functional global variables are non-reentrant VIs, the possibility of race conditions is eliminated.
References: *Suggestions for Using Execution Systems and Priorities*
21. **Correct Answer:** C
Topic: Loops
Justification: The For Loop executes 5 times. Starting with the value of 1, the result of the previous iteration is multiplied by 2. Thus, the value in the indicator after 5 iterations is equivalent to $1 \times 2 \times 2 \times 2 \times 2 \times 2$ (2^5), or 32.
References: *Passing Multiple Values to the Next Loop Iteration, Using Shift Registers to Remember Iteration Values* (Topic of the LabVIEW 2010 Help)
22. **Correct Answer:** C
Topic: Arrays and Clusters
Justification: The Array Subset function takes an input array and returns a section of that array as specified, starting at the given index and continuing for a number of elements equal to length. Here, the index value 3 specifies the fourth element of the array, or 10. Since the specified length is value 4, an array of length 4 is returned as follows: {10, 8, 5, 7}.
References: *Array Subset Function*
23. **Correct Answer:** A
Topic: Documentation
Justification: The documentation window in VI Properties is the only place to edit the information about the VI that appears in Context Help.
References: *VI Description Property, Documentation Page (VI Properties Dialog Box)*
24. **Correct Answer:** D
Topic: Loops
Justification: For Loops refer to the input to the Count terminal to determine how many iterations to execute.
References: *For Loop*
25. **Correct Answer:** C
Topic: Property Nodes
Justification: Since the indicator terminal is not isolated from the data being written by any structures, there is no reason not to wire the data directly to the indicator instead of using a Property Node. It is always best practice to wire directly when possible, because using variables or Property Nodes to update values can cause race conditions if not used carefully.
References: *Block Diagram Data Flow, Using Local and Global Variables Carefully*

26. **Correct Answer:** A

Topic: Timing

Justification: Answers B and D are incorrect because the Wait Until Next ms Multiple function executes before loop iterations terminate, not after. Answer C is incorrect, because it describes the functionality of the Wait (ms) function.

References: *Wait Until Next ms Multiple Function*

27. **Correct Answer:** B

Topic: Synchronization and Communication

Justification: Answer C is incorrect because semaphores cannot pass data. Answer A is incorrect because notifiers pass data, but they can only pass one element at a time. Data is overwritten and lost if the program writes to the notifier twice before data is read. Answer D is incorrect because local variables have no mechanism for determining when data is updated, so there is no way to tell if data is newly-acquired or not. Queues support multiple elements and operate using a FIFO principle, guaranteeing that no data is lost or overwritten.

References: *Synchronization VIs and Functions*

28. **Correct Answer:** B

Topic: Arrays and Clusters

Justification: There is no need to make an array of arrays since you can simply add dimensions to an existing array.

References: *Changing Array Dimensions*

29. **Correct Answer:** A

Topic: Case Structures

Justification: Arrays are not accepted by the case selector terminal because the case selector terminal requires a scalar value.

References: *Creating Case Structures*

30. **Correct Answer:** D

Topic: File I/O

Justification: LabVIEW represents arrays as a list of bytes containing a header and array data. The header contains a 4-byte integer for each dimension that specifies the length of that dimension. Following the header is the actual array data. In the question, the array has two dimensions. There are 4 bytes in the header for each dimension for a total of 8 bytes in the header. Since the array is composed of 8-bit, or 1-byte integers, there is a total of 9 bytes of actual array data. This makes a total of 17 bytes being written to file.

References: *Flattened Data, Creating Binary Files, How LabVIEW Stores Data in Memory*

31. **Correct Answer:** B

Topic: Sequence Structures

Justification: The sequence local is first written to in frame 1. Thus, in frame zero, no data is available to read since no data has yet been written.

References: *Adding and Removing Sequence Local Terminals*

32. **Correct Answer:** C
Topic: Timing
Justification: The Wait (ms) function does nothing to release or allocate memory or specify processor core. All it does is cause the execution of a VI to pause for a short time to allow the processor time to complete other tasks.
References: *Wait (ms) Function*
33. **Correct Answer:** A
Topic: Data Types
Justification: Rings can use any numeric representation while enums can use only unsigned integers.
References: *Ring Constant, Enum Constant*
34. **Correct Answer:** C
Topic: Event Structures
Justification: The event case shown handles two events: the Mouse Down event on the **Button** control, and the Mouse Down Event on the pane, or front panel. These two events occur simultaneously, so the event structures queues them up, and handles one and then the other. Thus two iterations occur, and the value in the shift register is incremented twice.
References: *Using Events in LabVIEW, Mouse Down Event*
35. **Correct Answer:** B
Topic: LabVIEW Programming Principles
Justification: Functions and VIs execute as soon as all of their inputs have data. Thus, it is the flow of data through the program that determines the order of execution.
References: *Block Diagram Data Flow*
36. **Correct Answer:** B
Topic: Data Types
Justification: The integers shown are unsigned 8-bit integers. The range for 8-bit integers is 0-255. The product of 2 times 128 is 256, one more than the maximum allowable value for an unsigned 8-bit integer. Thus, the value wraps around to 0.
References: *Numeric Data Types Table, Numeric Conversion*
37. **Correct Answer:** D
Topic: Error Handling
Justification: The Merge Errors function does not display any dialog. The One and Two Button Dialog functions are for general purpose and are not best applied for error handling applications. There is no error input on these functions. There is no VI with the name Generate Front Panel Activity. The Simple Error Handler is the best choice because it accepts an error cluster as an input and displays a dialog to the user in the event of an error.
References: *Handling Errors, Simple Error Handler VI*
38. **Correct Answer:** B
Topic: Charts and Graphs
Justification: XY graphs accept a cluster of two arrays, an X array and a Y array to generate a single plot. To generate multiple plots, XY graphs accept an array of these clusters.
References: *XY Graphs*

39. **Correct Answer:** C

Topic: Mechanical Action of Booleans

Justification: Since the mechanical action is set to Switch Until Released, two events are generated when a user clicks and releases. The first event is the FALSE to TRUE transition, and the second is the TRUE to FALSE transition. Latch actions are specifically designed to reset the value of the button after the change is read without generating a second event.

References: *Changing the Mechanical Action of a Boolean Object, Value Change Event, Using Events with Latched Boolean Controls*

40. **Correct Answer:** B

Topic: LabVIEW Programming Principles

Justification: When possible, it is always best to wire data directly to indicators. This helps maintain the Dataflow paradigm.

References: *Block Diagram Data Flow, Using Local and Global Variables Carefully*

Sample CLAD Exam