

APPENDIX D

Answers to True or False
and Fill in the Blanks

Chapter 1

Answers to True or False

1. True.
2. False. Although Charles Babbage is usually credited with the design of the first computer, one could argue that the counting boards in use in 500 BC from which the abacus was derived would qualify as a computer design.
3. False. Operating systems arrived on the scene quite late in the development of computers. Before then, the computer ran one application that did all the work, and this is still possible today.
4. False. The driver is just a pluggable operating system component.
5. True. For a computer to be useful, there has to be hardware to carry data to and from the processor.
6. True.
7. False. A solution solves the whole problem by assembling solutions to manageable subproblems. An algorithm is a series of steps to solve a small subproblem.

Answers to Fill in the Blanks

1. theoretical; practical
2. the Von Neumann architecture
3. virtual memory
4. utilities
5. application programs
6. logic
7. solutions to subproblems
8. states; states

Chapter 2

Answers to True or False

1. True.
2. False. Written correctly, algorithms can be generalized to solve a range of subproblems.
3. True. Both functional and object-oriented programs require procedural components to function on a processor.
4. True.
5. False. This is merely the assignment of the sum of x and y to z; you cannot make any inference about the value of y from this expression.
6. False. Untyped languages merely leave the programmer free of needing to define the type of data. The CPU has to have information about the nature of each data item in order to process it correctly.
7. True.

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8. False. In general, especially in MATLAB, the class of an item refers to its data type. The more restrictive definition combining the data type with the operations performed on it is an OOP restriction.
9. False. You must use scripts for permanent command storage.
10. True.
11. True. Clicking the icon to the left brings up the Document window.
12. False. Double-clicking a file name opens the file in the editor.
13. True.
14. True.
15. False. The asterisk indicates that the file has been changed since it was saved.
16. False. Comments appear only in the text of the script for human understanding of the logic.
17. False. Only the `(F5)` hot key saves before executing.

Answers to Fill in the Blanks

1. Abstraction
2. An algorithm
3. side effects
4. a numeric character
5. name; type
6. class; object; class
7. perform calculations; perform calculations
8. double-click; repeat the execution
9. name; current value; data type
10. double-click
11. double-click; variable name
12. automatically; MATLAB command
13. percent sign (%)
14. ignore; the end of the current line

Chapter 3

Answers to True or False

1. False. Homogeneous collections must consist of data of the same type. This could be `double`, `logical`, `char`, or any of the types you saw in this text.
2. True.
3. False. Because a column vector has more columns than rows, it returns the number of columns.
4. True. Regrettably, you can. This is the array linearization. Should you use this? No.
5. False. Either array can be a scalar quantity (a 1×1 array).
6. True, as long as the indices in the index vector do not exceed the dimensions of `A`.
7. False. The position of the values in the logical index vector corresponds to the position of values in the vector being indexed. Longer logical index vectors are reaching beyond the end of the original vector.
8. True.

Answers to Fill in the Blanks

1. numerical value; position in the vector
2. starting value; increment; ending value
3. elements; true values
4. parentheses

- 5. have the same dimensions; a scalar
- 6. the empty vector, []; complete rows or columns
- 7. bad; logical difficulties; indexing; copy the rows and columns you want to keep

Chapter 4

Answers to True or False

- 1. False. Comments are colored green; keywords that control execution are colored blue.
- 2. False. The MATLAB editor inserts indentation only to clarify for the reader the flow of control in a script.
- 3. True. If the `if` statement has no `else` clause, or the `switch` statement has no `otherwise` clause and the data provided matches none of the specified cases.
- 4. True.
- 5. False. The result that invalidates all other `&&` expressions is `false`.
- 6. True. But you can still use `break` to exit the loop early.
- 7. False. But it ought to be. This is really bad programming practice.
- 8. False. The expression specifies the reason to stay in the loop.

Answers to Fill in the Blanks

- 1. key command words
- 2. `all(...)`
- 3. `otherwise`
- 4. `true`
- 5. variable; values of data
- 6. `for` or `while`; innermost containing

Chapter 5

Answers to True or False

- 1. False. Functions have access to all the system data and functions and can also reach `global` data directly.
- 2. False. Although this ought to be True. MATLAB calls user-defined functions by the name of the m-file, and ignores the name specified there.
- 3. True.
- 4. False. Functions can be defined with no parameters required.
- 5. False. Any result for which a variable is not provided by the caller is ignored.
- 6. False. This is merely a convention suggested to clarify the source of their definition.

Answers to Fill in the Blanks

- 1. Procedural abstraction
- 2. actual; formal
- 3. vector-like container of variable names
- 4. Local Scope
- 5. first; first function; other auxiliary functions in the same file

Chapter 6

Answers to True or False

- 1. False. Casting changes the way the computer views a piece of data without changing it.
- 2. True.

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Appendix D Answers to True or False and Fill in the Blanks

- 3. False. It can be represented within a string by inserting two successive quote marks: (' ').
- 4. False. MATLAB will automatically cast the string to its ASCII values first.
- 5. True. But they have to be explicitly converted to characters and concatenated into one string.
- 6. False. Unequal length strings are reported as not being equal.
- 7. True.

Answers to Fill in the Blanks

- 1. a special internal representation
- 2. characters; numbers; punctuation marks; 0–127
- 3. `uint8(...)`; each letter
- 4. format control string; value parameters
- 5. `if`; cannot
- 6. `char(...)`; pads them with blanks

Chapter 7

Answers to True or False

- 1. False. None of the collective operations defined for numerical arrays can be applied to cell arrays or structures.
- 2. True.
- 3. True.
- 4. True.
- 5. False. It returns a new structure with the field and value removed.
- 6. True.
- 7. False. If `stra` is a structure array with the field `data`, the expression `{stra.data}` will extract all the values into a cell array.

Answers to Fill in the Blanks

- 1. extracted one at a time; replaced
- 2. arrays; containers
- 3. cell containing 42
- 4. `str.(field) = 42`
- 5. `struct(...)`; field name as a string; cell array of field contents

Chapter 8

Answers to True or False

- 1. True. Although the actual storage technique on a hard drive may have blocks of characters distributed randomly on its surface, the software that reads and writes the disk serializes the characters.
- 2. False. You save the variable names and their current values, not the programs that generated the data.
- 3. False. While some applications permit delimited strings to be embedded in comma- or tab-delimited files, MATLAB's readers read only numerical data into arrays.
- 4. False. You can use the qualifier 'a' to indicate that you will append to the end of an existing file.
- 5. True. If you read past the end of a file, a numerical -1 is returned.

Answers to Fill in the Blanks

- 1. values; organization
- 2. numerical values; double array; text data; cell array; both string and numerical data; cell array

- 3. numerical array; filled with zero
- 4. system dependent (for example, in the standard version on a PC, this is indicated by returning a file handle of -1)

Chapter 9

Answers to True or False

- 1. True.
- 2. False. If that function or any function it calls throws an exception, all the frames down to the function containing a `try ... catch` block are popped off the stack.
- 3. False. Tail recursive functions perform the math “on the way in.”
- 4. True. But this is a bad practice.
- 5. False. MATLAB actually does not care what the name of the file is. When a function is called, MATLAB finds the function by file name and starts the first function in that file whatever it is called. Local functions in the file must be called from that first function.

Answers to Fill in the Blanks

- 1. an alternative technique
- 2. wrapper function; check for erroneous data
- 3. runtime errors; programming errors; bad data
- 4. any tests or setup; as a helper to the main function call
- 5. compute; estimating the answer; recursive function.

Chapter 10

Answers to True or False

- 1. True.
- 2. False. All the elements might fail a test you apply to determine whether to change them or not.
- 3. False. Filtering might remove elements from the collection, but those that remain are not changed.
- 4. False. It really is folding because the two results are different attributes of the same element of the collection.
- 5. True. The `break` statement allows you to exit a `for` loop early; the code is a little obscure if written this way.
- 6. False. Sorting requires some criterion for deciding that one element must precede another—alphabetical order is a good example.

Answers to Fill in the Blanks

- 1. character of the data; basic operation(s) we are asked to perform
- 2. beginning with an empty collection; inserting elements one at a time
- 3. two or more collections
- 4. filter
- 5. folding
- 6. finding what you seek; failing to find it
- 7. traverse; writing

Chapter 11

Answers to True or False

- 1. True. If the `x` vector is omitted, 1:N is assumed for the independent parameter, and if the `str` is omitted, a solid blue line is used.

Appendix D Answers to True or False and Fill in the Blanks

2. False. To apply to a specific data plot, the enhancement functions must follow the plotting function.
3. False. Any area not provided with a plot remains blank.
4. True.
5. False. Bodies of rotation, for example, use one of the axis directions as an independent parameter.
6. False. It is the x and z axes (those axes not the axis of rotation).
7. False. The curve does not need to be continuous.
8. False. You can rotate the data to align an arbitrary axis with the x-axis, perform the body of rotation there, and invert the rotation.

Answers to Fill in the Blanks

1. new figure; the next higher
2. `clf`; close all
3. dependent; separate; independent
4. `z`; an x-y plaid
5. plaid; angles
6. linear curve; specified axis

Chapter 12

Answers to True or False

1. True. Even the most primitive data members encapsulate their data and control the operations that can be performed on the data.
2. False. It also works if one or both of the matrices are scalar.
3. True, only if one is a scalar; otherwise, False. If **A** and **B** are not square, one will fail; even if they are square, they will have different answers.
4. True.
5. False. It is equivalent to back dividing: $\mathbf{A} \setminus \mathbf{B}$.
6. True.

Answers to Fill in the Blanks

1. data; procedural
2. column; row
3. translate the object; perform the rotation; translate the rotated object back to P
4. N independent; N unknown; $N * (N + 1)$ constant

Chapter 13

Answers to True or False

1. False. 0 is the absence of light, which will give a black screen.
2. True. `imread(...)` can be adapted to read any supported image file, returning different results for different image styles.
3. True.
4. False. For two reasons—it only works for 2-D arrays, and the rotation is counter-clockwise.
5. True. Consider Figure 13.18. The original number of $1600 \times 1200 \times 3$ pixels has been reduced to a smattering of pixels of interest.

Answers to Fill in the Blanks

1. three; uint8; 0-255
2. pixel; uint8
3. decoded; true color; three color layers.

- 4. figure window; `image(...)`
- 5. Cropping; shrinking; stretching
- 6. transpose; major diagonal

Chapter 14

Answers to True or False

- 1. True.
- 2. False. Removing samples raises the frequency.
- 3. False. The number of bits in the recording has no significant effect on an untrained ear.
- 4. True.
- 5. True.

Answers to Fill in the Blanks

- 1. amplitude; frequency
- 2. A/D; D/A; pressure
- 3. 7; 5; 2; 12
- 4. sound energy; frequency band

Chapter 15

Answers to True or False

- 1. True. The provision is that while the linear interpolation does not give an error, it returns NaN for data points that are out of range.
- 2. True. There is a unique cubic parametric curve between each pair of points. The curve is parametric rather than a function of the independent variable in order to permit the curve to “double back” if necessary for smoothness.
- 3. False. All curve fitting does is provide the coefficients of a polynomial. You can insert any value of the independent variable.
- 4. True.
- 5. True. Simpson’s rule better captures fluctuations in the function being integrated.
- 6. False. The `diff(...)` function shortens the vector by one element.

Answers to Fill in the Blanks

- 1. Interpolation
- 2. coefficients of the equation; sum of the squared distances
- 3. central difference approximation; slope
- 4. `cumsum(...)`; dot product; the data vector; a vector of time differences
- 5. critical point; differentiating

Chapter 16

Answers to True or False

- 1. True. First we perform all the algebra to reduce the compound expression to a sequential series of $O(\dots)$ values, and then we add them and remove any terms that increase more slowly with N than other terms.
- 2. False. Linear search algorithms are $O(N)$, but binary search is $O(\log N)$.
- 3. True. Mathematicians have proven that one cannot sort with a faster Big O . However, better algorithms can provide a constant multiplier improvement.
- 4. False. Most of them have some kind of optimization that reduces the length of the minor passes.

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Appendix D Answers to True or False and Fill in the Blanks

5. True. Since Big O should reflect the worst case performance, and quick sort on a sorted collection is $O(N^2)$.

Answers to Fill in the Blanks

1. Big O; work; data
2. N
3. Merge; quick
4. Bubble; Quick
5. ad at the end; or string