

Review Questions

Multiple Choice

1. A _____ structure can execute a set of statements only under certain circumstances.
 - a. sequence
 - b. circumstantial
 - c. decision
 - d. Boolean
2. A _____ structure provides one alternative path of execution.
 - a. sequence
 - b. single alternative decision
 - c. one path alternative
 - d. single execution decision

3. A(n) _____ expression has a value of either True or False.
- binary
 - decision
 - unconditional
 - Boolean
4. The symbols $>$, $<$, and $==$ are all _____ operators.
- relational
 - logical
 - conditional
 - ternary
5. A(n) _____ structure tests a condition and then takes one path if the condition is true, or another path if the condition is false.
- if statement
 - single alternative decision
 - dual alternative decision
 - sequence
6. You use a(n) _____ statement to write a single alternative decision structure.
- test-jump
 - if
 - if-else
 - if-call
7. You use a(n) _____ statement to write a dual alternative decision structure.
- test-jump
 - if
 - if-else
 - if-call
8. and, or, and not are _____ operators.
- relational
 - logical
 - conditional
 - ternary
9. A compound Boolean expression created with the _____ operator is true only if both of its subexpressions are true.
- and
 - or
 - not
 - both
10. A compound Boolean expression created with the _____ operator is true if either of its subexpressions is true.
- and
 - or
 - not
 - either

11. The _____ operator takes a Boolean expression as its operand and reverses its logical value.
 - a. and
 - b. or
 - c. not
 - d. either
12. A _____ is a Boolean variable that signals when some condition exists in the program.
 - a. flag
 - b. signal
 - c. sentinel
 - d. siren

True or False

1. You can write any program using only sequence structures.
2. A program can be made of only one type of control structure. You cannot combine structures.
3. A single alternative decision structure tests a condition and then takes one path if the condition is true, or another path if the condition is false.
4. A decision structure can be nested inside another decision structure.
5. A compound Boolean expression created with the and operator is true only when both subexpressions are true.

Short Answer

1. Explain what is meant by the term “conditionally executed.”
2. You need to test a condition then execute one set of statements if the condition is true. If the condition is false, you need to execute a different set of statements. What structure will you use?
3. Briefly describe how the and operator works.
4. Briefly describe how the or operator works.
5. When determining whether a number is inside a range, which logical operator is it best to use?
6. What is a flag and how does it work?

Algorithm Workbench

1. Write an if statement that assigns 20 to the variable y, and assigns 40 to the variable z if the variable x is greater than 100.
2. Write an if statement that assigns 0 to the variable b, and assigns 1 to the variable c if the variable a is less than 10.
3. Write an if-else statement that assigns 0 to the variable b if the variable a is less than 10. Otherwise, it should assign 99 to the variable b.

4. The following code contains several nested `if-else` statements. Unfortunately, it was written without proper alignment and indentation. Rewrite the code and use the proper conventions of alignment and indentation.

```
if score >= A_score:
print('Your grade is A.')
else:
if score >= B_score:
print('Your grade is B.')
else:
if score >= C_score:
print('Your grade is C.')
else:
if score >= D_score:
print('Your grade is D.')
else:
print('Your grade is F.')
```

5. Write nested decision structures that perform the following: If `amount1` is greater than 10 and `amount2` is less than 100, display the greater of `amount1` and `amount2`.
6. Write an `if-else` statement that displays 'Speed is normal' if the speed variable is within the range of 24 to 56. If the speed variable's value is outside this range, display 'Speed is abnormal'.
7. Write an `if-else` statement that determines whether the `points` variable is outside the range of 9 to 51. If the variable's value is outside this range it should display "Invalid points." Otherwise, it should display "Valid points."
8. Write an `if` statement that uses the turtle graphics library to determine whether the turtle's heading is in the range of 0 degrees to 45 degrees (including 0 and 45 in the range). If so, raise the turtle's pen.
9. Write an `if` statement that uses the turtle graphics library to determine whether the turtle's pen color is red or blue. If so, set the pen size to 5 pixels.
10. Write an `if` statement that uses the turtle graphics library to determine whether the turtle is inside of a rectangle. The rectangle's upper-left corner is at (100, 100) and its lower-right corner is at (200, 200). If the turtle is inside the rectangle, hide the turtle.

Programming Exercises

1. Day of the Week

Write a program that asks the user for a number in the range of 1 through 7. The program should display the corresponding day of the week, where 1 = Monday, 2 = Tuesday, 3 = Wednesday, 4 = Thursday, 5 = Friday, 6 = Saturday, and 7 = Sunday. The program should display an error message if the user enters a number that is outside the range of 1 through 7.

2. Areas of Rectangles

The area of a rectangle is the rectangle's length times its width. Write a program that asks for the length and width of two rectangles. The program should tell the user which rectangle has the greater area, or if the areas are the same.

3. Age Classifier

Write a program that asks the user to enter a person's age. The program should display a message indicating whether the person is an infant, a child, a teenager, or an adult. Following are the guidelines:

- If the person is 1 year old or less, he or she is an infant.
- If the person is older than 1 year, but younger than 13 years, he or she is a child.
- If the person is at least 13 years old, but less than 20 years old, he or she is a teenager.
- If the person is at least 20 years old, he or she is an adult.

4. Roman Numerals

Write a program that prompts the user to enter a number within the range of 1 through 10. The program should display the Roman numeral version of that number. If the number is outside the range of 1 through 10, the program should display an error message. The following table shows the Roman numerals for the numbers 1 through 10:

Number	Roman Numeral
1	I
2	II
3	III
4	IV
5	V
6	VI
7	VII
8	VIII
9	IX
10	X

5. Mass and Weight

Scientists measure an object's mass in kilograms and its weight in newtons. If you know the amount of mass of an object in kilograms, you can calculate its weight in newtons with the following formula:

$$\text{weight} = \text{mass} \times 9.8$$

Write a program that asks the user to enter an object's mass, then calculates its weight. If the object weighs more than 500 newtons, display a message indicating that it is too heavy. If the object weighs less than 100 newtons, display a message indicating that it is too light.

6. Magic Dates

The date June 10, 1960, is special because when it is written in the following format, the month times the day equals the year:

6/10/60

Design a program that asks the user to enter a month (in numeric form), a day, and a two-digit year. The program should then determine whether the month times the day equals the year. If so, it should display a message saying the date is magic. Otherwise, it should display a message saying the date is not magic.