Activity #6: If/Else Statements

Recorder's Report

Manager:

Reader:

Recorder:

Driver:

Date:

Score: Satisfactory / Not Satisfactory

Record your team's answers to the key questions (marked with 🔑) below.

a) Model 1, Question #4

b) Model 2, Question #6

c) Model 3, Question #11.d

Activity #6: If/Else Statements

In this course, you will work in teams of 3–4 students to learn new concepts. This activity will introduce you to branching using if/else statements in C++.

Content Learning Objectives

After completing this activity, students should be able to:

- Implement the C++ version of an `if/else` statement
- Generate testing data for programs that include `if/else` statements
- Use conditional operators with strings and numeric values.
- Explain the purpose of a nested `if/else` statement.
- Explain how to test code that uses an `if/else/if` structure

Process Skill Goals

During the activity, students should make progress toward:

- Write code that includes `if`, `if/else`, and `if/else/if` statements.

Model 1 A C++ Program

```
1  #include <iostream>
2
3  using namespace std;
4
5  int main() {
6    float originalPrice, salePrice;
7    cout << "Enter the original cost of the item: ";
8    cin >> originalPrice;
9    cout << "Enter the sale price: ";
10   cin >> salePrice;
11   int percentOff = ((originalPrice - salePrice)/originalPrice) * 100;
12   cout << "Percent off: " << percentOff << "%" << endl;
13   if (percentOff >= 50) {
14     cout << "You found a great deal!" << endl;
15   }
16 }
17
```

Refer to Model 1 above as your team develops consensus answers to the questions below.

Questions (15 min) Start time:

1. You will find this program in `activity06a.cpp`. Run it with various original cost and sale prices and then answer the questions below.

a) What do lines 7 and 8 do?

b) What do lines 9 and 10 do?

c) What do lines 11 and 12 do?

d) What do lines 13 and 14 do?

2. Revise the program in model 1 so that right after printing "You found a great deal!" it prints "Congratulations!" if the percent savings was 50% or more. Use a separate `cout` statement to do this and make note of what you did below.

3. Revise the code further so that it prints "Done!" when the program is complete, no matter what the percent off is. Again, use a separate `cout` statement and describe how the placement of this line of code differs from the placement of the code you added above.

4. What happens if you remove the open curly brace (`{`) from the end of line 13 and 🔑 the close curly brace (`}`) from line 15 (16 in your modified program)? Explain why this happens.

Model 2 Another C++ Program

```
 1 #include <iostream>
 2
 3 using namespace std;
 4
 5 int main() {
 6   int numCredits = 194;
 7   double majorGPA = 2.9;
 8   double overallGPA = 2.1;
 9   if ( /* missing Boolean expression */ ) {
10     cout << "Congratulations!" << endl;
11     cout << "You seem to meet the criteria for graduation." << endl;
12   } else {
13     cout << "Sorry!" << endl;
14     cout << "You do not meet all the criteria for graduation." << endl;
15   }
16 }
17
```

Refer to Model 2 above as your team develops consensus answers to the questions below.

Questions (15 min) Start time:

5. In order to graduate from WWU with a Bachelor's degree, students must have earned at least 192 credits, have a GPA of at least 2.0 in their major, and have an overall GPA of at least 2.0 (among other things). Which of the following Boolean expressions should be used on line 8 of this model to test if a student meets these graduation criteria?

```
numCredits >= 192 || majorGPA >= 2.0 || overallGPA >= 2.0

numCredits > 192 && majorGPA > 2.0 && overallGPA > 2.0

numCredits > 191 && majorGPA >= 2.0 && overallGPA >= 2.0

numCredits >= 192 && majorGPA >= 2.0 && overallGPA >= 2.0
```

6. Add the Boolean expression you chose above to the program in `activity06b.cpp`. Create test data to check all eight (2 × 2 × 2) different combinations for the sub-expressions of the Boolean expression. Then run each of those test cases and verify that the program passes the test.

Test Case	`numCredits`	`majorGPA`	`overallGPA`	Expected (graduate/don't)	Passed
1					
2					
3					
4					
5					
6					
7					
8					

7. A *edge case test* is a test of a natural edges or boundary of the program. An example of a natural boundary in this program is where the `majorGPA` is exactly 2.0, since this is a division line in determining if somebody can graduate. Give at least two other edge cases that could be tested.

Model 3 A Third C++ Program

```cpp
#include <iostream>

using namespace std;

int main() {
  int grade;
  cout << "Enter your grade: ";
  cin >> grade;
  if (grade >= 90) {
    cout << "Very Good!" << endl;
  } else {
    if (grade >= 60) {
      cout << "Satisfactory." << endl;
    } else {
      cout << "Poor." << endl;
    }
  }
}
```

Refer to Model 3 above as your group develops consensus answers to the questions below.

Questions (20 min) Start time:

8. Circle the `if/else` statement that is *nested* inside of another `if/else` statement.

9. This code can be found in the file `activity06c.cpp`. Give three different grade values that could be used to test different parts of the program. Indicate what part of the program the value is testing.

Test	`grade` Value	Part of Program Tested
1		
2		
3		

10. Run the program and enter try your tests. Does everything work as expected?

11. Consider the code snippet below.

```
if (grade >= 90) {
  cout << "Very Good!" << endl;
} else if (grade >= 60) {
  cout << "Satisfactory." << endl;
} else {
  cout << "Poor." << endl;
}
```

a) Replace lines 9-17 in model 3 with this code. How does the output change?

b) Which method of solving this problem contains simpler syntax and indentation – the one in the original model, or the one above? Explain.

c) You can use as many `else/if` statements as you need. Suppose you wanted to add the comment "Good!" for grades that are between 80 and 90. Write the code for this change.

d) Does it make a difference where you add the additional `else/if` statement? Compare adding it at line 3 in the code snippet above vs. at line 5.

e) Is the use of the final `else` statement mandatory when creating an `if/else/if` statement? Try it out and supply an example to support your claim.

f) Make one final change to your program. Adjust it so that it prints an error message if the grade entered is greater than 100 or less than 0.