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Homework #6

1. 100% Coverage

i) *Does 100% branch coverage mean 100% statement coverage? Why?*

Answer: When talking about 100% branch coverage, we identify that when thing is 100% coverage does not always mean that we find all the problems within in our code. With this, when talking about 100% branch coverage, **it is achievable for the 100% statement coverage** also. This is due to that branch coverage will try to find the branch to execute or find section that does not have branch at all in the code. This will lead to also executing every statement and making achievable for 100% statement coverage when using 100% branch coverage.

ii) *Does 100% statement coverage mean 100% branch coverage? Why?*

Answer: When looking at the opposite way of this method. **It is not possible when 100% statement coverage mean 100% branch coverage.** This is due to when statement coverage will try it best to get 100% coverage in the code, but sometimes it will not reach all branch coverage as some test in branch might pass even though it can be incorrect. In hence, this is not possible, but it is possible the other way around.

iii) *Explain i) and ii) with an example.*

Answer: Below it is an example of both methods

For the number **i)**, below is a code snippet will show 100% branch coverage which also will show 100% statement coverage.

```
void sample () {
    int x = 0;
    if (x > 0)
        do nothing
    else if (x < 0)
        do nothing
    else
        print ("Value is: ", x);
}
```

The above code shows that the function given an int value of 0, and it goes through every possible branch condition that can be possible and

print out value 0 at the `else` statement. This is a 100% branch coverage, but at the same time, it went through every statement in the function which also achieve 100% statement coverage. As this code prove that 100% branch coverage can have a 100% statement coverage.

For the number **ii**), below is a code snippet will show how 100% statement coverage will not have work on the branch coverage.

```
bool check = true;
int division (bool check) {
    int x = 0;
    if (check == true) {
        x = 1;
    }
    return 50/x;
}
```

We assign a Boolean to be true which does through the entire statement of the function which will give 100% statement coverage, but it will fail for 100% of branch coverage as it never checks or think about division by 0 is even possible. So, that why 100% branch coverage cannot happen.

2. Statement Coverage

i) *Demonstrate statement coverage for the above code snippet. What inputs would you provide to the code snippet to get maximum statement coverage? If a 100% statement coverage is possible, what are the inputs?*

Answer: Below is some example inputs for the code that present in the homework:

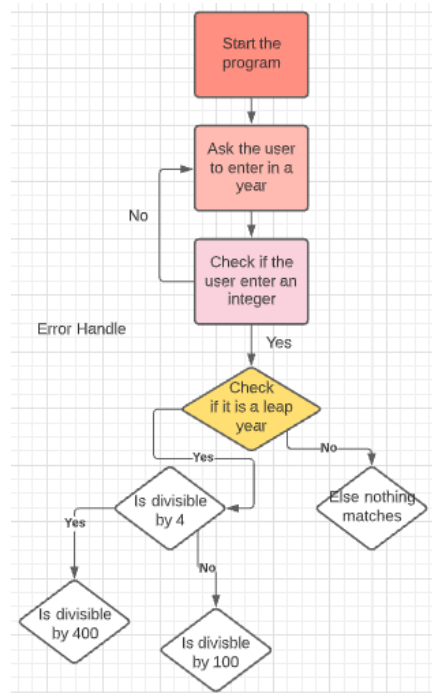
Inputs	Coverage %
X = 3, Y = 5	6/9 = 75%
X = 3, Y = 4	7/9 = 78%
X = 0, Y = 0	5/9 = 56%

In the input, I provided some inputs and the best that the program can have a maximum statement is 7 out of the 9-statement coverage we have in the code. That will be at value x to be 3 and y to be 4. **It is not possible** to achieve 100% statement coverage as there are many if statements contradict which each other to pass like the example of if statement has $(x > y * y)$ & statement $(x * 2 < y)$. There is no number that fit both for these statements as it is either one is accepted while the other will fail vice versa.

3. Leap Year Program Revisit

i) Include flowchart of leap year logic from Homework-1

Answer: Below is a layout of the flowchart from homework #1 of the leap year program:



ii) Demonstrate any two from i) ii) and iii) using the leap year code as an example.

Answer: I will be using the two of them to demonstrate it. The method I will be using is: i) Statement Coverage & ii) Branch Coverage

For this I will use the value of the year = 2000 to demonstrate the two coverage.

Statement Coverage (Total of 10 statements in this flowchart)

Input	Output	Coverage %
Year = 2000	"It is a leap year"	9/10 = 90%

Branch Coverage (Total of 4 branches in total for the flowchart)

Input	Output	Coverage %
Year = 2000	"It is a leap year"	2/4 = 50%

4. More Coverage

i) In the table below for the inputs provided, write the output and the % of statement coverage.

Answer: Below will display the output and coverage based on the input that was given:

Input	Output	Coverage %
Hour = 13, Temp = 77	"eat lunch", "go", "swim"	9/9 = 100%
Hour = 14, Temp = 74	"eat lunch" & "go"	8/9 = 89%

ii) Explain how you obtained the outputs and the % of statement coverage.

Answer: To obtain the output, I just follow the code from top to bottom and follow every if statement was given to me. If the statement matches, I know that the output and repeat until the end of the function using the hour and temp variable that was given. To find the percentage of statement coverage, I count how many statements there is in total in the code, then take how statement that was trigger by the variable that was given. Then take that number divide by the total to give me the percentage of the statement coverage.