**Trent University**
COIS1020H
**Lab 3 Answer Document**

## 1) Introduction to Methods (with Debugging)

b) Run the program using input Smith and 98

What is the syntax error and how did you fix it?

Error is : grade = MarkToGrade();
Since, no value is being passes in the MarkToGrade method, it is the error. So we pass inpMark
and fix the error :-
grade = MarkToGrade(inpMark);

What is the output?

Enter the last name of the student => Smith
Enter a mark between 0 and 100 => 98
Smith's mark of 98 converts to a A

c) Run the program using input Smith and 34

What is the output?

Enter the last name of the student => Smith
Enter a mark between 0 and 100 => 34
Smith's mark of 34 converts to a F

d) Run the program using input Smith and 59

What is the output?

Enter the last name of the student => Smith
Enter a mark between 0 and 100 => 59
Smith's mark of 59 converts to a D

e) Run the program using input Smith and 72

What is the output?

Enter the last name of the student => Smith
Enter a mark between 0 and 100 => 72
Smith's mark of 72 converts to a C

f) Run the program using input Smith and 83

What is the output?

Enter the last name of the student => Smith
Enter a mark between 0 and 100 => 83
Smith's mark of 83 converts to a B

g) Run the program using input Smith and then -1, 101 and 90 for the marks

What is the output?

Enter the last name of the student => Smith
Enter a mark between 0 and 100 => -1
Enter a mark between 0 and 100 => 101
Enter a mark between 0 and 100 => 90
Smith's mark of 90 converts to a A

Why do you think the input values for weight in Parts (b)-(g) were chosen?

To check all if-else cases are working correctly or not. The cases include grades A, B, C, D, F. And all the input values from b-g covered all the cases.

h) Now we are going to see how the Debugger can help us understand the functionality of methods.

Single step from Line 55 and describe what you are see in terms of where you are in the program (line number), what is in the *Locals* window (variables and values), and what is in the *Call Stack* window (will require two to three more single steps to see the program jump.

Line 55 highlighted : return letterValue;
Line 56 highlighted: } - which means we have come to an end of method MarkToGrade
Line 21 highlighted: grade=MarkToGrade(inpMark);
Locals Window:

| Name | Value | Type |
|---|---|---|
| Lab3_1.MarkToGrade returned | 66 'B' | char |
| inpMark | 75 | int |
| lastName | "Smith" | string |
| grade | 32 ' ' | char |

Call stack window: >Lab3_1.exe!Lab3_1.Main() Line 22 C#

The value of letterValue is passed to grade

Line 25 is highlighted: `Console.WriteLine("{0}'s mark of {1} converts to a {2}", lastName, inpMark, grade);`

Locals Window:

| Name | Value | Type |
|---|---|---|
| inpMark | 75 | int |
| lastName | "Smith" | string |
| grade | 66 'B' | char |

Call Stack Window: >Lab3_1.exe!Lab3_1.Main() Line 25 C#

> Lab3_1.exe!Lab3_1.Main() Line 27 C#

Output: Enter the last name of the student => Smith
Enter a mark between 0 and 100 => 75
Smith's mark of 75 converts to a B

> Lab3_1.exe!Lab3_1.Main() Line 28 C#

i) Remove the BreakPoint from Line 21:

What error message did you receive and why?

We receive an error that name inpMark doesn't exist. That is because variable inpMark was defined in Main() method and this is MarkToGrade(int) method where there is no such variable defined. We just passed the value of 'inpMark' to the MarkToGrade (int) method when we called that method. And the value was stored in mark which is defined as an integer in the MarkToGrade(int mark) method.

j) Remove the extra line from Part (i). Now let's change the method header to include a call by address (reference) parameter.

What is the output?

Enter the last name of the student => Smith
Enter a mark between 0 and 100 => 98
Smith's mark of 98 converts to a A

What do you notice about the output relative to what you saw in Part (b)?

The output we got in part(b) is same as what we saw in this part for the same input

Why did we have to remove Line 35 (try putting it back in)?

We had to remove Line 35 because the variable letterValue cannot be declared as it was used to

define a local variable when the method is called, and values are passed. The variable is used to define a reference parameter in an enclosed scope.

What did we have to remove Line 55 (try putting it back in)?

We remove Line55 since it said return letterValue but now there is no need to return the value of letterValue because it is no longer a variable declared in the method but it was used to define a reference parameter when the method is called from method Main() and so after the MarkToGrade() method is carried on and a value is assigned to letterValue, it actually goes in the reference of letterValue and is returned back as a reference to Grade in the Main() method.

Why did the method call (invocation) in Line 21 have to change?

Since we changed the method from MarkToGrade(int) to MarkToGrade(int, ref char), while calling of this method we need to pass in two values, one int and one char since none of the two in MarkToGrade method are optional parameters and so we MUST assign a value to them.
Thus, Line21 has to be changed from grade=MarkToGrade(inpMark); to MarkToGrade(inpMark, ref grade);

k) One last set of changes to the program from Part (j).

What error message did you receive and why?

Error message:
There is no argument given that corresponds to the required formal parameter letterValue of Lab3_1.MarkToGrade(int, ref char)

We receive this error message because the MarkToGrade() has two parameters and while calling the method we are passing only one parameter value in the method. We write grade= but since there is no value being returned and the grade's reference value needs to be passed to the second parameter, we get the error.

What if we change Line 21 to:

What error message did you receive and why?

Error message:
Cannot implicitly convert void to char

We get this error message because our method MarkToGrade() is void that means no value is to be returned. and no value is returned but while calling the method we are writing grade=MarkToGrade(inpMark, ref Grade) that means we are assigning grade the value being returned by the method

Finally, how about if we change Line 21 to:

What error messages did you receive and why?

2 Error messages:

1) Argument 1 cannot be passed with a 'ref' keyword
2) Argument 2 must be passed with a 'ref' keyword.

The method MarkToGrade(int, ref char) has two parameters where the first parameter is int data type while the second parameter has a 'ref' keyword that means it is a reference parameter . Also while calling the method, the order we assign the values to the arguments matters so argument datatype should match the parameter type in the method.

Answer all the highlighted questions in a file and then submit a PDF of this file (called it Lab3_1.pdf) to the Lab 3 dropbox. When asked "What is the output", simply type in what is seen in the output window.

## 2) Putting it All Together

b) Build the solution.

What is the output?

Enter the last name of the employee => Smith
Enter the number of hours worked (> 0) => 40
Enter the hourly pay rate(>0)=> 12.5
Enter percent of tax(between 0 and 1)=> 0.2
Smith worked 40 hours at $12.50 per hour
The gross pay of employee Smith is $500.00 and the net pay of Smith is $400.00

c) Run the program using the input data: Smith, -8, 40, 12.5, 0.2

What is the output?

Enter the last name of the employee => Smith
Enter the number of hours worked (> 0) => -8
Enter the number of hours worked (> 0) => 40
Enter the hourly pay rate(>0)=> 12.5
Enter percent of tax(between 0 and 1)=> 0.2
Smith worked 40 hours at $12.50 per hour
The gross pay of employee Smith is $500.00 and the net pay of Smith is $400.00

d) Run the program using the input data: Smith, 40, -3, 12.5, 0.2

What is the output?

Enter the last name of the employee => Smith
Enter the number of hours worked (> 0) => 40
Enter the hourly pay rate(>0)=> -3
Enter the hourly pay rate(>0)=> 12.5
Enter percent of tax(between 0 and 1)=> 0.2
Smith worked 40 hours at $12.50 per hour
The gross pay of employee Smith is $500.00 and the net pay of Smith is $400.00

e) Run the program using the input data: Smith, 40, 12.5, 9, 0.2

What is the output?

Enter the last name of the employee => Smith
Enter the number of hours worked (> 0) => 40
Enter the hourly pay rate(>0)=> 12.5
Enter percent of tax(between 0 and 1)=> 9
Enter percent of tax(between 0 and 1)=> 0.2
Smith worked 40 hours at $12.50 per hour
The gross pay of employee Smith is $500.00 and the net pay of Smith is $400.00

f) Run the program using the input data: Smith, 44, 12.5, 0.2

What is the output?

Enter the last name of the employee => Smith
Enter the number of hours worked (> 0) => 44
Enter the hourly pay rate(>0)=> 12.5
Enter percent of tax(between 0 and 1)=> 0.2
Smith worked 44 hours at $12.50 per hour
The gross pay of employee Smith is $550.00 and the net pay of Smith is $440.00

g) Now let's add another user-defined method to our program … this method will compute any overtime pay

What is the output?
Enter the last name of the employee => Smith
Enter the number of hours worked (> 0) => 40

Enter the hourly pay rate(>0)=>  12.5
Enter percent of tax(between 0 and 1)=> 0.2
Smith worked 40 hours at $12.50 per hour
The gross pay of employee Smith is $500.00 with $0.00 overtime pay and the net pay of Smith is $400.00

h) Run the program using the input data: Smith, 44, 12.5, 0.2

What is the output?
Enter the last name of the employee => Smith
Enter the number of hours worked (> 0) => 44
Enter the hourly pay rate(>0)=>  12.5
Enter percent of tax(between 0 and 1)=> 0.2
Smith worked 44 hours at $12.50 per hour
The gross pay of employee Smith is $575.00 with $25.00 overtime pay and the net pay of Smith is $460.00

How does the result differ from Part (f)?

In part(f) we got gross pay $550.00 and net pay $440.00
Here, we got gross pay $575.00 and ne pay $460.00
The gross pay has $25.00 extra than part(f) because we calculated the overtime pay now. We calculated an extra 1.5 rate for the 4 hours overtime. (Overtime is number of hours greater than 40).

i) Run the program using the input data: Smith, 20, 12.5, 0.2

What is the output?

Enter the last name of the employee => Smith
Enter the number of hours worked (> 0) => 20
Enter the hourly pay rate(>0)=>  12.5
Enter percent of tax(between 0 and 1)=> 0.2
Smith worked 20 hours at $12.50 per hour
The gross pay of employee Smith is $250.00 with $0.00 overtime pay and the net pay of Smith is $200.00

Once you are comfortable that the program works correctly, demonstrate it to the lab personnel, answer all the highlighted questions in a file and then submit your Lab3_2.pdf and Lab3_2.cs files to the Lab 3 dropbox