

ENGG1340 Computer Programming II
COMP2113 Programming Technologies
Module 5 Self-Review Exercise

1. Evaluate the following expressions:

Give the (i) function header; (ii) function prototype (without parameter names), for each of the following functions:

- (a) Function `hypotenuse` that takes two double-precision, floating-point arguments, `side1` and `side2`, and returns a double-precision, floating-point result.
- (b) Function `smallest` that takes three integers, `x`, `y` and `z`, and returns an integer.
- (c) Function `instructions` that does not receive any arguments and does not return a value. [Note: Such functions are commonly used to display instructions to a user.]
- (d) Function `intToDouble` that takes an integer argument, `number`, and returns a double-precision, floating-point result.

Example solution for (a):

- (i) `double hypotenuse(double side1, double side2)`
- (ii) `double hypotenuse(double, double);`

- (b) (i) `int smallest(int x, int y, int z)`
- (ii) `int smallest(int, int, int);`
- (c) (i) `void instructions()`
- (ii) `void instructions();`
- (d) (i) `double intToDouble(int number)`
- (ii) `double intToDouble(int);`

2. Define a function `hypotenuse` that calculates the length of the hypotenuse of a right triangle when the other two sides are given. Use this function in a program to determine the length of the hypotenuse for each of the following triangles. The function should take two arguments of type `double` and return the hypotenuse as a `double`.

```
#include <iostream>
#include <cmath>
using namespace std;

double hypotenuse( double, double );

int main()
{
    double side1, side2;
    for ( int i = 1; i <= 3; ++i )
    {
        cout << "\nEnter 2 sides of right triangle: ";
        cin >> side1 >> side2;
        cout << "Hypotenuse: " << hypotenuse( side1, side2 ) << endl;
    }
    return 0;
}

double hypotenuse( double s1, double s2 )
{
    return sqrt( s1 * s1 + s2 * s2 );
}
```

3. Find the error(s) in each of the following program segments, and explain how the error(s) can be corrected:

```
(a)  int g()
    {
        cout << "Inside function g" << endl;
        int h()
        {
            cout << "Inside function h" << endl;
        }
    }
```

```
(b)  int sum( int x, int y )
    {
        int result;
        result = x + y;
    }
```

```
(c)  double square( double number )
    {
        double number;
        return number * number;
    }
```

- (a) *Error: Function h is defined in function g.*
Correcion: Move the definition of h out of the definition of g.
- (b) *Error: The function is supposed to return an integer, but does not.*
Correction: Delete variable result and place the following statement in the function: return x + y;
- (c) *Error: Variable number is declared twice.*
Correction: Remove the declaration within the {}.

4. What is the output of the following program?

```
#include <iostream>
using namespace std;

void find(int a, int &b, int &c);

int main()
{
    int one, two, three;

    one = 5;
    two = 10;
    three = 15;

    find(one, two, three);
    cout << one << ", " << two << ", " << three << endl;

    find(two, one, three);
    cout << one << ", " << two << ", " << three << endl;

    find(three, two, one);
    cout << one << ", " << two << ", " << three << endl;

    find(two, three, one);
    cout << one << ", " << two << ", " << three << endl;
}
```

```

        return 0;
    }

    void find(int a, int& b, int& c)
    {
        int temp;

        c = a + b;
        temp = a;
        a = b;
        b = 2 * temp;
    }

```

```

5, 10, 15
20, 10, 15
25, 30, 15
45, 30, 60

```

5. Consider the following program that will generate a random number between 1 and 3.
- ```
int computerChoice = rand() % 3 + 1;
```

Write a program that allows a user to play the Rock Paper Scissors game with computer continuously. Take a look at the following sample run.

```

What do you choose? [1: Rock| 2: Paper| 3: Scissors| 4: Exit]: 1
Computer: 2, User: 1
The computer won!
What do you choose? [1: Rock| 2: Paper| 3: Scissors| 4: Exit]: 2
Computer: 1, User: 2
You won!
What do you choose? [1: Rock| 2: Paper| 3: Scissors| 4: Exit]: 3
Computer: 3, User: 3
It was a tie!
What do you choose? [1: Rock| 2: Paper| 3: Scissors| 4: Exit]: 4

```

```

#include <cstdlib>
#include <iostream>
using namespace std;

int main() {
 // Definition
 // 1: Rock
 // 2: Paper
 // 3: Scissors

 cout << "What do you choose? [1: Rock| 2: Paper| 3: Scissors| 4: Exit]: ";
 int userChoice;
 cin >> userChoice;
 while (userChoice != 4) {

 int computerChoice = rand() % 3 + 1;

 cout << "Computer: " << computerChoice << ", User: " << userChoice << endl;
 }
}

```

```
 if (computerChoice == userChoice) {
 cout << "It was a tie!" << endl;
 } else if (computerChoice == 1 && userChoice == 3) {
 cout << "The computer won!" << endl;
 } else if (computerChoice == 2 && userChoice == 1) {
 cout << "The computer won!" << endl;
 } else if (computerChoice == 3 && userChoice == 2) {
 cout << "The computer won!" << endl;
 } else {
 cout << "You won!" << endl;
 }

 cout << "What do you choose?. [1: Rock| 2: Paper| 3: Scissors| 4: Exit] ";
 cin >> userChoice;
 }

 return 0;
}
```