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| **Subject Name** | **TCS3024 / TNS3033 – Introductory Programming** |
| **Topic** | **User-defined Function** |

Answer ALL questions.

**PART A**

State the output of the following program:

|  |  |
| --- | --- |
| 1) |  |
|  | In my\_fun, a = 20, b = 42, c = 4  In main, a = 2, b = 3, c = 4 |
| 2) |  |
|  | In my\_fun, a = 20, b = 42, c = 4  In main, a = 2, b = 42, c =4 |
| 3) |  |
|  | 45  46  47  72 |

**PART B: Lab Exercises**

1. Create a C++ function called **findMaximum** that takes two numbers as parameters and returns the maximum of the two. Additionally, provide a sample usage of this function in a C++ program.

#include<iostream>

using namespace std;

int findMaximum (int a, int b);

int main(){

    cout<<"Enter two numbers:"<<endl;

    int a, b;

    cin>>a>>b;

    int c = findMaximum(a,b);

    cout<<c;

    return 0;

}

int findMaximum (int a, int b){

    int c;

    if (a >= b)

        c = a;

    else

        c = b;

    return c;

}

1. Modify the previous C++ program that includes a function named **findMinimum** that calculates the minimum of two numbers. Provide a sample usage of both functions in the updated C++ program.

#include<iostream>

using namespace std;

int findMaximum (int a, int b);

int findMinimum (int a, int b);

int main(){

    cout<<"Enter two numbers:"<<endl;

    int a, b;

    cin>>a>>b;

    int c = findMaximum(a,b);

    int d = findMinimum(a,b);

    cout<<"The "<<c<<" is bigger then "<<d;

    return 0;

}

int findMaximum (int a, int b){

    int c;

    if (a >= b)

        c = a;

    else

        c = b;

    return c;

}

int findMinimum (int a, int b){

    int c;

    if (a >= b)

        c = b;

    else

        c = a;

    return c;

}

1. Write a C++ program that calculates the average of three numbers. Create a function named **calculateAverage** that takes three numbers as parameters and returns their average. Additionally, provide a sample usage of this function in the C++ program.

#include<iostream>

using namespace std;

float calculateAverage (float a, float b, float c);

int main(){

    cout<<"Enter three numbers:"<<endl;

    float a, b, c;

    cin>>a>>b>>c;

    float d = calculateAverage(a,b,c);

    cout<<"The Average is "<<d;

    return 0;

}

float calculateAverage (float a, float b, float c){

    float d = (a + b + c) / 3;

    return d;

}

1. Write a C++ program to calculate the area of a rectangle. Create a function named **calculateRectangleArea** that takes the length and width of the rectangle as parameters and returns its area. Additionally, provide a sample usage of this function in the C++ program.

#include<iostream>

using namespace std;

float calculateRectangleArea (float a, float b);

int main(){

    float l, w;

    cout<<"Enter the Length and width:"<<endl;

    cin>>l>>w;

    cout<<"The area of rectangle is "<<calculateRectangleArea(l,w);

    return 0;

}

float calculateRectangleArea (float a, float b){

    int c = a \* b;

    return c;

}

**EXTRA**

**Question 1**

Create a program with the following requirements:

* In the main function, prompt the user for two integers.
* Create three *sub-functions* named **sum**, **difference**, and **product** which will add, subtract, and multiply integers respectively.
* In the main function, **call each of the *sub-function*** while **passing the values of the two integers entered by the user.**
* Each of the sub-function will accept the two integers and calculate and **return the result** back to main function.
* In the main function, display the result for each calculation.

Sample Output:

Graphical user interface, text, application

Description automatically generated

#include<iostream>

using namespace std;

int sum (int a, int b);

int difference (int a, int b);

int product (int a, int b);

int main(){

    int a, b;

    cout<<"Please enter the first integer: ";

    cin>>a;

    cout<<"Please enter the second integer:";

    cin>>b;

    cout<<"~Result of calculation~"<<endl;

    cout<<"The sum is: "<<sum(a,b)<<endl;

    cout<<"The difference is: "<<difference(a,b)<<endl;

    cout<<"The product is: "<<product(a,b)<<endl;

    return 0;

}

int sum (int a, int b){

    return a + b;

}

int difference (int a, int b){

    int c;

    if (a > b){

        c = a - b;

    }

    else if (b > a){

        c = b - a;

    }

    else{

        c = 0;

    }

    return c;

}

int product (int a, int b){

    return a \* b;

}

**Question 2**

Create a program with the following requirements:

* In the main function, use a loop to prompt and accept THREE integers from the user.
* Create a sub-function named **evenOrodd**.
* Every time the loop in the main function runs, other than prompting the user for an integer, the main function will also **call the evenOrOdd sub-function** while **passing the value of the integer entered by the user**.
* The sub-function **evenOrodd** will then accept the integer and then uses the modulus operator to determine whether the integer is even or odd. **The sub-function will then display the result** on the screen.

Sample Output:

Graphical user interface, text, application

Description automatically generated

#include<iostream>

using namespace std;

string evenOrodd (int a);

int main(){

    for (int i; i <= 2; i++){

        int a;

        cout<<"Enter an integer: ";

        cin>>a;

        cout<<"The number is "<<evenOrodd(a)<<endl<<endl;

    }

    return 0;

}

string evenOrodd (int a){

    string r;

    a = a % 2;

    if (a == 0){

        r = "even";

    }

    else{

        r = "odd";

    }

    return r;

}

**Question 3**

Create a program with the following requirements:

* In the main function, declare three integers and name it as a, b, and c.
* Create a *sub-function* named **getValue** to prompt the user for three integers.
* In the main function, **call the getValue sub-function** and **pass the variables a, b, and c.**

***(****Note: You are required to use* ***passing by******reference*** *to get the value of the integers entered by the user from the getValue sub-function).*

* Create another two *sub-functions named* **add10** and **multiply** respectively.
* In the main function, **call the add10 sub-function**and **pass the values of the integers entered by the user** to the sub-function. The sub-function will accept the integers and add all integers with 10 and **display the new values** on the screen.
* In the main function, **call the multiply sub-function** and **pass the values of the integers entered by the user** to the sub-function. The sub-function will then accept the integers and multiply the integers with each other and **return the result** to the main function.
* In the main function, display the result of the multiplication.

Sample Output:

Graphical user interface, text, application

Description automatically generated

#include <iostream>

using namespace std;

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

void add10 (int& a, int& b, int& c);

int multiply (int& a, int& b, int& c);

int main(){

    int a, b, c;

    getValue(a,b,c);

    add10(a,b,c);

    cout<<endl<<"Multiplication of original values: "<<multiply(a,b,c);

    return 0;

}

void getValue (int& a, int& b, int& c){

    cout<<"Enter three integers..."<<endl;

    cin>>a>>b>>c;

}

void add10 (int& a, int& b, int& c){

    cout<<endl<<"After addition of 10:-"<<endl;

    cout<<"a: "<<a+10<<endl;

    cout<<"b: "<<b+10<<endl;

    cout<<"c: "<<c+10<<endl;

}

int multiply (int& a, int& b, int& c){

    return a\*b\*c;

}