**LAB Week 6:**

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**Reg#:Sp21-BSE-008**

**Exercise 1:** Recall the programme you wrote to implement a simple calculator now rewrite the same programme using functions.

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| **Solution 1:**  **//takes something return something**  **#include<stdio.h>**  **float add(float n1, float n2);**  **float sub(float n1, float n2);**  **float mult(float n1, float n2);**  **float div(float n1, float n2);**  **int main()**  **{**  **char operator;**  **float n1,n2,result=0.0;**  **printf("Enter the operator:");**  **scanf("%c",&operator);**  **printf("Enter the number:\n");**  **scanf("%f%f",&n1,&n2);**  **switch(operator)**  **{**  **case '+':**  **result = add(n1,n2);**  **break;**  **case '-':**  **result = sub(n1,n2);**  **break;**  **case '\*':**  **result = mult(n1,n2);**  **break;**  **case '/':**  **result = div(n1,n2);**  **break;**  **}**  **printf("%.2f %c %.2f = %.2f", n1,operator,n2, result);**  **return 0;**  **}**  **float add(float n1, float n2)**  **{**  **return n1 + n2;**  **}**  **float sub(float n1, float n2)**  **{**  **return n1 - n2;**  **}**  **float mult(float n1, float n2)**  **{**  **return n1 \* n2;**  **}**  **float div(float n1, float n2)**  **{**  **return n1 / n2;**  **}**    //takes nothing ::::return nothing  #include<stdio.h>  void calculator(); //function declaration  int main()  {  calculator(); // function call  }  void calculator() //function define  {  char operator;  float n1,n2,result=0.0;  printf("Enter the operator:\n");  scanf("%c",&operator);  printf("Enter the Number:\n");  scanf("%f%f",&n1,&n2);  switch(operator)  {  case '+':  result=n1+n2;  printf("%.2f",result);  break;    case '-':  result=n1-n2;  printf("%.2f",result);  break;    case '/':  result=n1/n2;  printf("%.2f",result);  break;    case '\*':  result=n1\*n2;  printf("%.2f",result);  break;  }    }  #include<stdio.h>  int calculator(); //function decalaration  int main()  {  int i;  for(i=0;i<=10;i++)  calculator(); // function call  }  int calculator() //function define  {  char op;  float n1,n2,result=0.0;  printf("\nEnter the operator:\n");  scanf(" %c",&op);  printf("Enter the Number:\n");  scanf("%f%f",&n1,&n2);  if(op=='+')  {  printf("The sum is %.2f",n1+n2);  }  else if(op=='-')  {  printf("The subtraction is %.2f",n1-n2);  }  else if(op=='\*')  {  printf("The Multiplication is %.2f",n1\*n2);  }  else if(op=='/')  {  printf("The division is %.2f",n1/n2);  }  else  {  printf("invalid Operator");  }  }  #include<stdio.h>  int main()  {  calculatoradd();  calculatordivide();  calculatormulti();  calculatorsub();  }  calculatoradd()  {  int a,b;  printf("Enter the Number:\n");  scanf("%d%d",&a,&b);    int c;  c=a+b;  printf("The sum is:%d\n",c);  printf("------------\n");  }  calculatordivide()  {  int a,b;  printf("Enter the Number:\n");  scanf("%d%d",&a,&b);  int c;  c=a-b;  printf("The divition is:%d\n",c);  printf("------------\n");  }  calculatormulti()  {  int a,b;  printf("Enter the Number:\n");  scanf("%d%d",&a,&b);  int c;  c=a\*b;  printf("The multiplication is:%d\n",c);  printf("------------\n");  }  calculatorsub()  {  int a,b;  printf("Enter the Number:\n");  scanf("%d%d",&a,&b);  int c;  c=a/b;  printf("The subtraction is:%d\n",c);  printf("------------");  } |

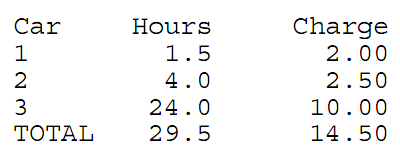
**Exercise 2:** Write a program that uses six calls to the function rand() to generate six random integer numbers, num1, num2, num3, num4, num5, and num6, and then print them out.

num1 should be in the range 1 to 2 (inclusive), num2 should be in the range 1 to 100 (inclusive), num3 should be in the range 0 to 9, num4 should be in the range 1000 to 1112 (inclusive), num5 should be in the range -1 to 1, and num 6 should be in the range -3 to 11.

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| **Solution:**  **#include<stdio.h>**  **#include<stdlib.h>**  **void randomnumber1(); //function prototype**  **void randomnumber2();**  **void randomnumber3();**  **void randomnumber4();**  **void randomnumber5();**  **void randomnumber6();**  **int main()**  **{**  **randomnumber1(); //function call**  **randomnumber2();**  **randomnumber3();**  **randomnumber4();**  **randomnumber5();**  **randomnumber6();**  **}**  **void randomnumber1() //function define**  **{**  **int num1;**  **num1=rand()%2+1; //int num=rand()%((upper-lower)+1)+lower**  **printf("%d\n",num1);**  **}**  **void randomnumber2()**  **{**  **int num2;**  **num2=rand()%100+1;**  **printf("%d\n",num2);**  **}**  **void randomnumber3()**  **{**  **int num3;**  **num3=rand()%10+0;**  **printf("%d\n",num3);**  **}**  **void randomnumber4()**  **{**  **int num4;**  **num4=rand()%113+1000;**  **printf("%d\n",num4);**  **}**  **void randomnumber5()**  **{**  **int num5;**  **num5=rand()%3-1;**  **printf("%d\n",num5);**  **}**  **void randomnumber6()**  **{**  **int num6;**  **num6=rand()%15+-3;**  **printf("%d\n",num6);**  **}** |

**Exercise 3:**A car park charges a £2.00 minimum fee to park for up to 3 hours, and an additional £0.50 for each hour or part hour in excess of three hours. The maximum charge for any given 24-hour period is £10.00. Assume that no car parks for more than 24 hours at a time.

Write a C program that will calculate and print the parking charges for each of 3 customers who parked their car in the car park yesterday. The program should accept as input the number of hours that each customer was parked, and output the results in a neat tabular form, along with the total receipts from the three customers:



The program should use the function calculate\_charges to determine the charge for each customer.

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| **Solution:**  **#include <stdio.h>**  **float calculateCharges( float hours );**  **float charge;**  **int main()**  **{**  **int customer;**  **float one;**  **float two;**  **float three = 0;**  **float hours;**  **for( customer = 1; customer <= 3; customer++ ) {**  **printf( "Enter customer #%d parking hours:\n ", customer );**  **scanf( "%f", &hours );**  **if( customer == 1 )**  **one = hours;**  **else if( customer == 2 )**  **two = hours;**  **else**  **three = hours;**  **}**  **printf("-------------------------------\n");**  **printf("Built By Muhammad Talha Shafiq \n");**  **printf("Reg No# SP21-BSE-008 \n");**  **printf("-------------------------------\n");**  **printf( "%s%10s%12s", "Car", "Hours", "Cost" );**  **printf( "\n%d%12.1f%12.1f", 1, one, calculateCharges( one ) );**  **printf( "\n%d%12.1f%12.1f", 2, two, calculateCharges( two ) );**  **printf( "\n%d%12.1f%12.1f", 3, three, calculateCharges( three ) );**  **printf( "\n%s%8.1f%12.1f", "TOTAL", one + two + three, calculateCharges( one ) + calculateCharges( two ) + calculateCharges( three ) );**  **}**  **float calculateCharges( float hours )**  **{**  **if(hours==0)**  **return 0;**  **if(hours<=3)**  **return charge=2;**  **else if (hours>3 && hours <19)**  **return charge=2+(0.5\*(hours-3));**  **else if (hours>=19 && hours<=24)**  **return charge=10;**  **}** |

**Exercise 4:**Implement the following functions. The functions return a real number:

(a) Function celsius returns the Celsius equivalent of a Fahrenheit temperature (Hint: 0 Celsius is equal to 32 Fahrenheit and 100 Celsius is equal to 212 Fahrenheit).

(b) Function Fahrenheit returns the Fahrenheit equivalent of a Celsius temperature. Use these functions to write a program that prints charts showing the Fahrenheit equivalent of all Celsius temperatures between 0 and 100 degrees, and the Celsius equivalent of all Fahrenheit temperatures between 32 and 212 degrees. Print the output neatly in a table.

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| **Solution:**  **#include <stdio.h>**  **void temperature();**  **int main()**  **{**  **temperature();**  **temperature();**  **temperature();**  **return 0;**  **}**  **void temperature()**  **{**  **float fh,cl;**  **int choice;**    **printf("\n1: Convert temperature from Fahrenheit to Celsius.");**  **printf("\n2: Convert temperature from Celsius to Fahrenheit.");**  **printf("\nEnter your choice (1, 2): ");**  **scanf("%d",&choice);**    **if(choice ==1){**  **printf("\nEnter temperature in Fahrenheit: ");**  **scanf("%f",&fh);**  **cl= (fh - 32) / 1.8;**  **printf("Temperature in Celsius: %.2f\n",cl);**  **printf("-----------------------------\n");**  **}**  **else if(choice==2){**  **printf("\nEnter temperature in Celsius: ");**  **scanf("%f",&cl);**  **fh= (cl\*1.8)+32;**  **printf("Temperature in Fahrenheit: %.2f\n",fh);**  **printf("-----------------------------\n");**  **}**  **else{**  **printf("\nInvalid Choice !!!");**  **}**  **}** |

**Exercise 5:** The greatest common divisor of integers x and y is the largest integer that divides both x and y. Write a recursive function GCD that returns the greatest common divisor of x and y. The GCD of x and y is defined as follows: If y is equal to zero, then GCD(x, y) is x; otherwise GCD(x, y) is GCD(y, x % y) where % is the remainder operator.

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| **Solution:**  **#include <stdio.h>**  **int hcf(int n1, int n2); //hcf highest common factor //function prototype or declaration**  **int main()**  **{**  **int n1, n2;**  **printf("Enter two positive integers: \n");**  **scanf("%d %d", &n1, &n2);**  **printf("G.C.D of %d and %d is %d.", n1, n2, hcf(n1, n2));**  **return 0;**  **}**  **int hcf(int n1, int n2) //function define**  **{**  **if (n2 != 0)**  **return hcf(n2, n1 % n2);**  **else**  **return n1;**  **}** |