CSE 115 Lab on simple loop (part 3) – Ara2

1. Write a C program to read 2 integers: n and r from user and compute the value of $^nP_r = \dfrac{n!}{(n-r)!}$

Inefficient Code	Efficient Code
| ```c
#include <stdio.h>

void main()
{
    int n,r,m=1,d=1,i;
    printf("Enter n and r: ");
    scanf("%d %d", &n, &r);
    //compute n!
    for(i=1;i<=n;i++)
        m*=i;

    //compute (n-r)!
    for(i=1;i<=n-r;i++)
        d*=i;

    printf("nPr = %d", m/d);
}
``` | ```c
#include <stdio.h>

void main()
{
    int n,r,p=1,i;

    printf("Enter n and r: ");
    scanf("%d %d", &n, &r);

    //compute nPr = (n-r+1)(n-r+2)… (n-1)n
    for(i=n-r+1;i<=n;i++)
        p*=i;

    printf("nPr = %d", p);
}
``` |

Try Yourself 1: Write a C program to read 2 integers: n and r from user and compute the value of $^nC_r = \dfrac{n!}{r!(n-r)!}$

2. Write a C program to find Least Common Multiple (LCM) of two given numbers.

```c
#include <stdio.h>

void main()
{
    int i, n1, n2, max, lcm=1;

    printf("Enter any two numbers to find LCM: ");
    scanf("%d %d", &n1, &n2);

    i = max = (n1>n2) ? n1 : n2; //compute the max of n1 and n2;  this is the lowest possible value of LCM
    while(1)  //while condition is always true (1)
    {
        if(i%n1==0 && i%n2==0)      // If i is a multiple of both n1 and n2 then i is the LCM of n1 and n2
        {
            lcm = i;
            break;  //break out of the loop since LCM has been found
        }
        //we come to the next line if current value of i is not the LCM
        i += max;  //values of i are: max, 2*max, 3*max, …, all of which are possible values of LCM
    }

    printf("\nLCM of %d and %d = %d\n", n1, n2, lcm);
}
```

Try Yourself 2: Write a C program to read 3 integers sand compute their LCM.

3. Write a C program display a given number in words starting from its <u>rightmost</u> digit

```c
#include <stdio.h>
void main()
{
   int num, i;
   printf("Enter any number to print in words: ");
   scanf("%d", &num);
   // Finds last digit of the number and print it in words
   while(num!=0)
   {
     switch(num%10)  {
        case 0: printf("Zero "); break;
        case 1: printf("One "); break;
        case 2: printf("Two "); break;
        case 3: printf("Three "); break;
        case 4: printf("Four "); break;
        case 5: printf("Five "); break;
        case 6: printf("Six "); break;
        case 7: printf("Seven "); break;
        case 8: printf("Eight "); break;
        case 9: printf("Nine ");
     }//end of switch
     num = num/10;
   }//end of while loop
}
```

<u>Exercise Problems</u>:
1. Write a C program to find Greatest Common Divisor (GCD) of two given integers. GCD of two integers is the highest number that totally divides those two integers. E.g. GCD of 15 and 25 is 5.
2. Write a C program to compute the quadruple factorial of a given number n, $q(n) = \frac{(2n)!}{n!}$
3. Write a C program to compute the super-factorial of a given number n, $sf(n) = 1! * 2! * 3! * ...n!$

<u>Assignment Problems</u>:
1. Write a C program to display a given number in words starting from its <u>leftmost</u> digit.
   <u>Hint</u>: Compute the reverse of the given number and then use a while loop like practice 3 to print the digits.
   E.g., if input number is 1234 your program should print "One Two Three Four".
2. Write a C program to convert a given Binary number to its Decimal equivalent.
3. Write a C program to convert a given decimal number to its binary equivalent.
4. Write a C program to compute the sum of the series: 1/1! + 1/2! + 1/3! + ... + 1/n! where n is an input.
5. Write a C program that prints all even numbers between m and n (m,n are user inputs) except the ones which are divisible by 3. [*Hint*: Use continue statement within a loop] Sample input/output:
   Enter m: **99**
   Enter n: **116**
   All even numbers between 100 and 112 except those divisible by 3 are: 100, 104, 106, 110, 112, 116,
6. Write a C program that asks a shopper to enter amount (in kg) and total price of sugar he bought from different places. If the shopper mistakenly enters a negative number as amount/price, it prints an error message "Invalid input, enter a positive number" and prompts the shopper to give another input. When the shopper enters 0 as an amount then the program terminates and shows the shopper total amount, price and average price of sugar per kg. [*Hint*: Use continue statement within a loop] Sample input/output:
   Enter amount (in kg): **5**
   Enter price: **350**
   Enter amount (in kg): **-3**
   Invalid input, enter a positive number
   Enter amount (in kg): **5**
   Enter price: **-67**
   Invalid input, enter a positive number
   Enter amount (in kg): **10**
   Enter price: **650**
   Enter amount (in kg): **0**
   Total amount (in kg): 15, Total price: 1000, Average price per kg: 66.67