

CS 341 Assignment 2

MIPS - II

Deadline: 06/09/21 05:00 PM

1. Write a MIPS program to do the following:
The program should take as input two **integers** n and r from the user

The program should compute nC_r using the following recursive formulation:

$${}^nC_r = {}^{n-1}C_{r-1} + {}^{n-1}C_r$$

The program should then display this value on the screen.

Your program should include at least one non-leaf subroutine.

Your program should prompt the user for input and display the output as shown below.

Constraints: $n \geq 1, r \geq 0$.

Sample run:

Enter n: 25

Enter r: 4

25C4: 12650

Wish to continue?: Y

Enter n: 24

Enter r: 9

24C9: 1307504

Wish to continue?: N

Output by your program is in **blue color**.

Caution: Using any other method to calculate nC_r will fetch you negative marks.

2. Write another MIPS program which does the following:
The program takes as input two coprime **integers** a and m from the user.

The program should compute the modular multiplicative inverse of a under modulo m , i.e., find an integer $x \in [1, m)$ such that

$$ax \equiv 1 \pmod{m}$$

The program then prints the value of x . (see sample run below)

For computing modular multiplicative inverse, implement the Extended Euclidean algorithm in MIPS to find **integers** x and y such that:

$$ax + my = 1 \quad (\gcd(a, m) = 1)$$

$\Rightarrow x \pmod{m}$ will give the modular multiplicative inverse of a under modulo m .

Constraints: $a \geq 1$, $m \geq 2$ and $\gcd(a, m) = 1$

Sample run:

Enter a: 5
Enter m: 26
 $5 \cdot 21 = 1 \pmod{26}$
Wish to continue?: Y

Enter a: 9
Enter m: 37
 $9 \cdot 33 = 1 \pmod{37}$
Wish to continue?: N

Output by your program is in **blue color**.

Caution: The naive approach of trying all numbers from 1 to $m-1$ will fetch you negative marks.

Submission Format:

Create a directory with name **<roll_number>_A2** consisting 2 files **q1.s** and **q2.s**.
Compress the directory to **<roll_number>_A2.zip** and then upload. (Please use 'zip' format only.)

Example:

```
180050076_A2.zip
|----180050076_A2
|      |---- q1.s
|      |---- q2.s
```

Please review your directory structure before submission.