

Classwork 10 CPE221 Computer Organization  
Instructor: Rahul Bhadani

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Student's Name: \_\_\_\_\_

As on Canvas

- ① Write an ARM program that uses stack pointers, frame pointers and stacks for implementing following C++ code. (20 points)

```
int power(int a, int b)
{
    if (b == 0)
        return 1;
    else
        return a * power(a, b-1);
}
```

```
int //  $a_n = a \cdot r^{n-1}$ 
    geometric-progression(int a, int r,
                           int n)
{
    int second-term = power(r, n-1);
    int result = a * second-term;
    return result;
}
```

```

int main()
{
    int a = 2;
    int x = 3;
    int n = 4;

    int d = geometric_progression(2, 3, 4);

    return 0;
}

```

Initialize stack pointer with 0x2000

Solution.

.text

.global main  
main:

MOV SP, #0x2000

MOV R0, #2 @ a = 2

MOV R1, #3 @ x = 3

MOV R2, #4 @ n = 4

BL geometric\_progression

done: B done

power:

@ prologue

PUSH {FP, LR} @ save FP and return addr

MOV FP, SP @ Set up new FP

@ function body

CMP R1, #0 @ R1 = b

BNE @ else

@ base case

MOV R0, #1

## B power-epilogue

power-else:

PUSH {R0} @ "save 'a'"

SUB R1, R1, #1

BL power

POP {R1} @ retrieve a

MUL R0, R1, R0

power-epilogue:

MOV SP, FP

POP {FP, LR}

BX LR

geometric - progression:

@ prologue

PUSH {FP, LR}

MOV FP, SP

@ function body

PUSH {R0}

MOV R0, R1

SUB R1, R2, #1

BL power

POP {R1} @ retrieve 'a'

MUL R0, R1, R0

@ epilogue

MOV SP, FP

POP {FP, LR}

BX LR