Computer Systems and -architecture

MIPS: Stacks and subroutines

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Time Schedule

Exercises are made individually. Put all your files in a tgz archive, as explained on the course's website, and submit your solution to the exercises on Blackboard.

- Deadline: **December 12, 23u55**

Exercises

Write a MIPS program for the MARS simulator for each of the following exercises. As always, document your solution well (use #).

1. Write a MIPS program that pushes and pops integers on the stack. Execute this sequence of push and pop operations:

```
push 7
push 15
pop
push 31
pop
push 63
pop
pop
```

2. (a) Write a MIPS program that reads an integer n (using a syscall), after which it reads n integers (using syscalls), and stores them in an array. Because you don't know the size of the array in advance, you will have to allocate space for it on the heap (*Hint: use syscall 9 for sbrk*).

   (b) Add a (leaf) procedure that prints an array. The procedure has two parameters: the address of the first element of the array and the number of elements in the array. Call the procedure with the array on the heap.

   (c) Add a (leaf) procedure that sorts an array. Call the procedure with the array on the heap. Implement the algorithm from the C++ function below.

```
void sort(int array[], int arrayLength)
{
    int nrOfSwaps;
    do {
        nrOfSwaps = 0;
        for(int i = 0; i < arrayLength - 1; i++) {
            if( a[i] > a[i + 1] ) {
                int temp = a[i];
                a[i] = a[i + 1];
                a[i + 1] = temp;
                nrOfSwaps++;
            }
        }
    }
    while(nrOfSwaps > 0);
}
```