**Objective:** To use the web-based simulator ("CPUlator") to better understand ...

1. The use of VCMP and VMRS to perform floating-point comparisons.
2. The use of VSUB and VMOV to simplify some floating-point comparisons.
3. The use of floating-point equality comparisons.

**To do offline:** Answer the questions that follow the listing below. (Numbers at far left are memory addresses.)

```
            .syntax      unified
            .global    _start

            // *** EXECUTION STARTS HERE ***

            00000000   _start:   MOVs   R0,0     // N flag = 0
            00000004   VLDR   S0,posPt4   // S0 = +0.4
            00000008   VLDR   S1,posPt5   // S1 = +0.5
            0000000C   VCMP.F32  S0,S1    // 0.4 < 0.5 ?
            00000010   VMRS    APSR_nzcv,FPSCR
            00000014   LDR     R0,=1     // Assume MI
            00000018   BMI     L1
            0000001C   LDR     R0,=0     // Wasn't MI

            00000020   L1:      VSUB.F32  S2,S0,S1   // S2 = 0.4 - 0.5
            00000024   VMOV    R1,S2
            00000028   LSR     R1,R1,31   // Same as R0?

            0000002C   VLDR   S3,negPt1   // S3 = -0.1
            00000030   VCMP.F32  S2,S3    // S2 == S3 ?
            00000034   VMRS    APSR_nczv,FPSCR
            00000038   LDR     R2,=1     // Assume EQ
            0000003C   BNEQ    done
            00000040   LDR     R2,=0     // Wasn't EQ

            00000044   done:     B       done     // Infinite loop

            00000048   point5:  .float    +0.5
            0000004C   point4:  .float    +0.4
            00000050   point1:  .float    -0.1

            .end
```
What is in the N flag (CPSR bit 31) after executing the VCMP at address 0000000C_{16}?

What is in the N flag (CPSR bit 31) after executing the VMRS at address 00000010_{16}?

What is in register R0 before executing the VSUB instruction at address 00000020_{16}?

What is in register S2 after executing the VSUB instruction at address 00000020_{16}?

What is in register R1 after executing the VMOV instruction at address 00000024_{16}?

What is in register R1 after executing the LSR instruction at address 00000028_{16}?

What is in register S3 after executing the VLDR instruction at address 0000002C_{16}?

What is in the Z flag (CPSR bit 29) after executing the VMRS at address 00000034_{16}?

What is in register R2 before executing the B instruction at address 00000044_{16}?

Getting ready: Now use the simulator to collect the following information and compare to your earlier answers.

1. Click [here](#) to open a browser for the ARM instruction simulator with pre-loaded code.

   *Note:* You can change the number format in the “Settings” window between hex, unsigned decimal and signed decimal as needed

**Step 1: Press F2 once per ARM instruction as needed to see what the simulator says for the following:**

What is in the N flag (CPSR bit 31) after executing the VCMP at address 0000000C_{16}?

What is in the N flag (CPSR bit 31) after executing the VMRS at address 00000010_{16}?

What is in register R0 before executing the VSUB instruction at address 00000020_{16}?

What is in register S2 after executing the VSUB instruction at address 00000020_{16}?

What is in register R1 after executing the VMOV instruction at address 00000024_{16}?

What is in register R1 after executing the LSR instruction at address 00000028_{16}?

What is in register S3 after executing the VLDR instruction at address 0000002C_{16}?

What is in the Z flag (CPSR bit 29) after executing the VMRS at address 00000034_{16}?

What is in register R2 before executing the B instruction at address 00000044_{16}?