

**Problem 1, continued:**

**Part C (5 points):** The C program below is intended to print the numbers from 10 down to 0 with one number per line. What does it actually do, and how could you fix it with one simple change?

```
#include <stdio.h>

int
main ()
{
    int x;

    for (x = 10; 0 < x; --x) {
        printf ("%d\n", x);
    }
    return 0;
}
```

**Part D\*\*\* (5 points):** Your friend is developing a magic 8-ball program for the LC-3. He shows you the following assembly code:

```

        LEA      R1, SOURCE
        LEA      R2, DEST
LOOP    LDR      R0, R1, #0
        STR      R2, R0, #0
        BRz      DONE
        ADD      R1, R1, #1
        ADD      R2, R2, #1
        BRnzp    LOOP
DONE:   LEA      R0, DEST
        TRAP     x22          ; PUTS
        TRAP     x25          ; HALT
SOURCE  .STRINGZ  "\"My sources say no\""
DEST    .BLKW     #20
MYDATA  .FILL     x0FFF
```

Your friend complains that when he runs this code with his test cases, it never finishes executing (in other words, it never reaches the HALT trap). Explain why. (Note that the two-character sequence \" inserts a single quotation mark, ASCII character x22, into a string.)

**Problem 5** (20 points): C and Stack Frames

This question focuses on the program below, and particularly on the stack frames (also called activation records) that are used by each function in the program.

```
#include <stdio.h>

/* function declarations */
int bar (int a, int b);
int foo (int* p);

int bar (int a, int b)
{
    int x = a + b;

    if (0 < a) {
        printf ("%d\n", a * b);
    }
    return x;
}

int foo (int* p)
{
    *p = bar (-4, 11);
    return 6;
}

int main ()
{
    int x = 0;
    int y;

    y = foo (&x);
    bar (x, y);
    return 0;
}
```

**Part A** (3 points): When someone runs the program, what is the order of subroutine calls for the program, starting from main? In other words, what is the sequence of JSR target over the whole program execution? Give a comma-separated list, including only the main, foo, and bar functions.

main,

**Part B** (3 points): What, if anything, is printed by the program?