

### Question 1

Our machine is little endian. Behold the following program:

```
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>

int main()
{
    unsigned char fp;
    unsigned short x;
    int ok;

    fp = 0;
    ok = 1;
    while (ok && fseek(stdin, fp, SEEK_SET) == 0) {
        if (fread(&x, sizeof(short), 1, stdin) != 1) {
            ok = 0;
        } else {
            fp = (x & 0xff);
            printf("%x ", fp);
        }
    }
    printf("\n");
}
```

Suppose the program is compiled to **a.out**.

Here is the output of **xxd** on **tmp.txt**:

```
UNIX> xxd -g 1 tmp.txt
00000000: 31 15 0f 3a 29 2f 18 19 1f 21 33 26 02 09 39 3b  1..:)/...!3&..9;
00000010: 1c 14 2f 34 2d 22 10 06 1d 1a 25 23 40 2c 30 17  ../4-"...%#@,0.
00000020: 1c 35 29 09 2e 28 09 11 30 0b 45 42 29 42 18 19  .5)..(..0.EB)...
00000030: 20 10 01 3c 2d 0d 01 0f 07 33 04 42 17 20 11 1b  ..<-....3.B. ..
UNIX>
```

What is the output of:

```
UNIX> ./a.out < tmp.txt
```

### Question 2

Adrian and Addison are in love, but Adrian's parents have forbidden Adrian from seeing or talking with Addison. However, there is hope. Addison works for a company that provides data for Adrian's company. Adrian's company uses a program that reads data with the following code snippet:

```
typedef struct {
    int id;
    double data[50];
} DR;

DR *read_data(FILE *f, int *nrec)
{
    int nrecords;
    DR *rv;

    fread(&nrecords, sizeof(int), 1, f);
    rv = (DR *) malloc(sizeof(DR) * nrecords);
    fread(rv, sizeof(DR), nrecords, f);
    *nrec = nrecords;
    return rv;
}
```

Addison is able to hide messages into the data files read by Adrian's company without breaking the software. What Addison does is take a file being sent to Adrian's company, and add a message to it. When Adrian's company reads the data, it works great. However, Adrian is able to write a program that extracts Addison's message from the data file.

Please explain in a few sentences (or however many you can add using your phone on the Turning app), how Addison embeds the hidden messages.

**Question 3:** Now that you have taken COSC360, do you think it should be required class for computer science?

**Question 4:** Now that you have taken COSC360, do you think it should be required class for computer engineering?

## Question 1

The code reads two bytes into **x**, and then sets **fp** to be the low order byte. So:

Iteration	fp	bytes-read	x	new-fp	what-is-written
0	0x00	0x31 0x15	0x1531	0x31	31
1	0x31	0x10 0x01	0x0110	0x10	10
2	0x10	0x1c 0x14	0x141c	0x1c	1c
3	0x1c	0x40 0x2c	0x2c40	0x40	40
4	fseek(stdin, 0x40, SEEK_SET) fails				

The answer is "31 10 1c 40"

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## Question 2

There are four bytes of padding in **DR** between **id** and **data**. Addison can hide the message in those four bytes. Please see <https://web.eecs.utk.edu/~jplank/plank/classes/cs360/360/notes/CStuff-2/lecture.html> for a discussion of padding in structs.

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## Question 3

This is an opinion question. Here are the class answers:

Year	Yes	No	Abstain
2024	60.00%	28.89%	11.11%

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## Question 4

This is an opinion question. Here are the class answers:

Year	Yes	No	Abstain
2024	59.09%	20.45%	20.45%