CS 240 SI Worksheet
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Bitwise Operations + Sequential Logic (Part 1)

1. Implement a C function that takes in 2 integers (x and y) and **return 1 if x < y, else 0.** Use as few operators as possible, and **only from the following**: `! ~ & ^ | + << >>` Numbers are allowed.

   Before you start: what test cases (sample values for x and y) would you use to prove that your implementation works? After implementing the function, simulate it on your test cases.

```
int lessThan(int x, int y) {




}
```

2. a. Draw a **D flip-flop** with **falling-edge trigger**, complete with **all of its gates** (including the ones in the leader + follower D latches) and labels:

b. Simulate the behavior of the flip-flop you drew, given the waveforms of D and C:

```
D        -------------|__________|-----------|___|----------------------|___|-----|_________|----------

C        ___|-------------|___|--|___|---|_________|------------------------------------|_______|------

QL/E

Q (QF)
```

What are the behaviors of Q_L/E and Q in relation to C?

How would the D flip-flop and its waveforms look if it has a **rising-edge** trigger? What would be the behavior of Q in relation to C?