Ask

Purpose

Create a timer that counts down from any time less than or equal to 9 minutes and 59 seconds

Inputs:

- User presses A to start timer
- User presses B to stop timer
- User presses D to input time
- Number keys enter time up to 9 minutes and 59 seconds
- Register values to turn on LED
- Configuration registers to output to LCD
- Register values to get input from keypad

Outputs

- LCD displays a prompt to enter the time
- LCD displays “Time Remaining” and then the current time remaining
- When the time remaining is 0:00, the LCD displays “Time’s Up”
- When a value is entered, a single LED lights up
- When time is up, multiple LEDs light up

Constraints

- LED blinks every time a value is entered
    - But not every keypress
- LCD displays a prompt before full value is entered, then “Time Remaining” until timer hits 0, then “Time’s Up”
- When timer hits 0, multiple LEDs blink

Research/Imagine

Timer:

- The Nucleo has count up and count down timers we can use
    - Ticker
    - Use that to trigger an interrupt
    - We know how many seconds left
    - Set an interrupt to count down
    - Then another at 0:00
        - Or decrement and check time every second

LCD

- The provided code has functions for creating an LCD object
- And for printing, moving the cursor, clearing the screen, etc

Plan

- Use the provided code to put text on the LCD
- Count down from the user entered time, checking for 0:00 every second
- Use three LEDs, so flash one for the first keypress, one for the second, one for the third (if used)
- Connect each column of the keypad to its own GPIO pin
- Use 4 GPIO pins to power each of the 4 rows, to determine which key is pressed

Variables

- int row: For the keypad, determine which key is pressed since we can only check entire column
- timeRemaining: How much time is left
- timePos: since the user can enter up to 3 numbers, and it's easiest to count down in seconds, track which keypress this is, so we can add first press *1 + second keypress * 10 + third press * 60 to get the total time.

Functions

- colOne
- colTwo
- colThree
- colFour
    - All of the above are interrupt handlers for each column
- LEDFlash: blink the correct LED based on the keypress number

Test Plan

1. Time with 1 keypress
2. Time with 2 keypresses
3. Time with 3 keypresses
4. Time with seconds > 60 in seconds places
5. Attempt to enter time > 9:59 (i.e 9:99)
6. Check that all LEDs flash when time is 0:00