Lab 2 - Tone Assignment

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1. The frequency of Middle C is 261.63Hz. In the assignment I rounded up to 262Hz. The period of C's oscillation is 1/261.63 = 0.003822 seconds.
2. In my program I defined the PIN number initially, then in the loop entered 0.5t as the delay after setting the PIN to high, then turned it to low, and set it to wait 0.5t before looping again.
3. To include more notes I moved middle C into an array, and then looped through the array in setup to build a new array defining 0.5t of each note, making it simpler to add notes without having to calculate the period by hand.
4. To get input from the serial monitor I added a condition in the loop to check if a the serial port was available and if it had a character (as it goes character by character). It then processes the character using a switch statement, if valid, calls playNote to play the note, passing in the required note half-period, otherwise it would either ignore the character (if invalid), or cause a delay if the character entered was a space (' '). The playNote function would first compute the amount of times that the buzzer would turn on and off ("oscillating"), by dividing a fixed time by the time of the half-period. This ensures that every note, regardless of frequency, would be played for the same duration of time. Then, for that amount of times, the PIN voltage would be set to high then low, at the notes frequency as in 2. As I included sharps, each note is given its character in lowercase for the actual note('g' -> G), and uppercase characters correspond to their sharpened versions ('D' -> D#, omitting of course E# and B#). C' or high C is given the character 'o'.
5. I came up with a version of the song "Happy Birthday" that was somewhat suitable (c c d c f e c c d c g f c c o a f e d A A a f g f) and played it.

buzzer

```
#define PIN 8
# define nLen 13

short notes[nLen] = {262, 277, 294, 311, 330, 349, 370, 399, 415, 440, 466, 494, 523};
float times[nLen] = {};

void setup() {
  Serial.begin(9600);
  pinMode(PIN, OUTPUT);
  for(int i=0; i<nLen; i++){
    times[i] = 500000*(1/float(notes[i]));
    Serial.print(times[i]);
    Serial.print("\n");
  }
}
```

```
void loop() {
  char ch;
  if(Serial.available()){
    ch = Serial.read();
  switch(ch){
    case 'c':
      playNote(times[0]);
      break;
    case 'C':
      playNote(times[1]);
      break;
    case 'd':
      playNote(times[2]);
      break;
    case 'D':
      playNote(times[3]);
      break;
```

```
void playNote(float t){
  int osc = int(100000/t);
  for(int i = 0; i < osc; i++){
    digitalWrite(PIN, HIGH);
    delayMicroseconds(t);
    digitalWrite(PIN, LOW);
    delayMicroseconds(t);
  }
}
```