Reflection for Project 1
Core:

- Explain your reasoning for your selected sampling rate

A sample is a value at a point of time and it's the first step to measure a signal at a fixed moment of time. In my program, I have used 44100 as the sampling rate as it provides a good quality of sound to be produced when using this sample rate, This is also based on the Nyquist Theorem, where the frequency should be high enough so that samples follow the original signal. Samples should also be taken at a rate faster 2f (f is frequency). If the frequency is not taken at a high enough rate the signal could be distorted which in turn produces low-frequency signals which are not in the original signal.

- Explain how you calculated the total number of samples

The sampling rate is the average number of samples obtained in one second (1 second = 1/T). The total number of samples is calculated by N = T/dt. N is the total amount of samples, T is the duration of the sound, dt is the time interval between samples. The number of samples is equal to duration * sample rate (nSamples = duration * sampleRate). I have initialised the sample rate as 44100.

```
int main(){
    WavSound sound1; //helper
    int sampleRate = 44100;
    int duration = 20;
    double dt = 1.0/41400;
    int nSamples = duration * sampleRate;
    int frequency = 5000;
    int* waveform = new int[nSamples];

    for (int iSample = 0; iSample < nSamples ; iSample++){
        double time = iSample *dt;
        double v = 5000 * sin(2*M_PI * frequency * time);
        waveform[iSample]=v;
        }

    sound1.MakeWavFromInt("tone1.wav", sampleRate, waveform, nSamples);
    delete(waveform);
    return 0;
}
```

- Explain your reasoning for your selection of the types of all variables

There are several variables that can be used in C++, I have only used a few of them for my project. Which are int, double and int*.
int is used when you are referring to whole numbers i.e. 42. I have used "int" for 'SampleRate', 'duration', 'nSample' and 'frequency' as they all involve whole number.

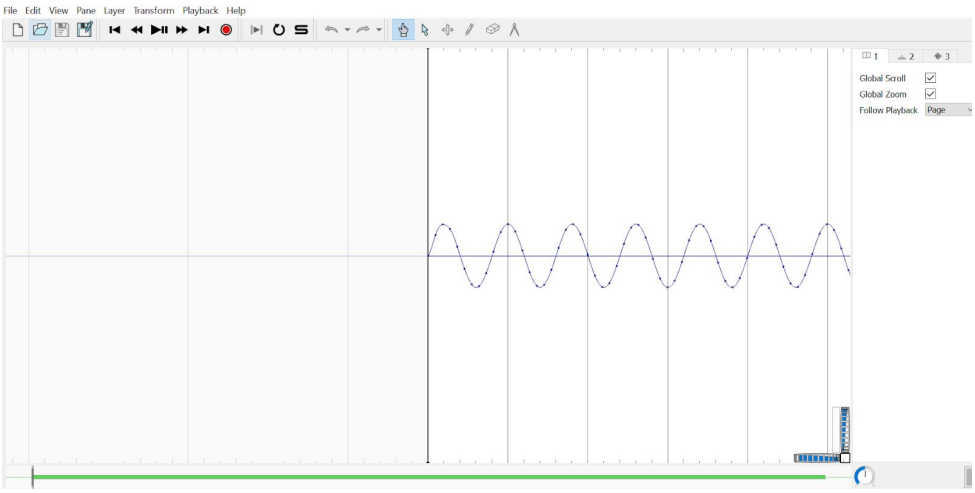
Double is used when you are using numbers that involve decimals i.e. 42.7

The int and double have been placed where they are needed.
‘samplesRate’, ‘duration’, ‘dt’, ‘nSamples’, ‘frequency’, are all different variables that are used.

int* is exactly like the above int variable but this includes a [1]pointer, the *. I have used this variable for ‘waveform’.

- Include a screenshot of the waveform obtained with SonicVisualizer. Does the waveform like what you intended?

The waveform does what it is intended to do. It runs for the specified time and the wave is constant.



Completion:

- Find and describe an alternative way to decide when to change the frequency. No need to code, just describe an algorithm.

To change frequency instead of using an if and else statement you could use
(frequency1 = i_repeats%2 == 0 ? 750.0 : 950 ;)
If you change the double frequency to a number (double frequency1 = 750.0;) and then input this code (frequency1 = i_repeats%2 == 0 ? 750.0 : 950 ;) into the second for loop. This is then able to change to the frequency of the project.

[1] "What does it mean by 'pointer to integer'? - Quora." 21 Sep. 2018, https://www.quora.com/What-does-it-mean-by-pointer-to-integer. Accessed 22 Apr. 2020.