

Lesson 5: Worksheet 5.2 – Make an alarm

In this activity, you need to write a program to make Edison play an alarm at a frequency you specify.

Using the `Ed.PlayTone()` function, you can customise the exact frequency of the sound that Edison's speaker produces by using numbers and variables.

Frequency in acoustics

As you may know, sound travels in waves called sound waves. Acoustics, the branch of physics that deals with sound and sound waves, looks at everything to do with sound, including how to measure it.

One way to measure sound is by measuring frequency. Frequency is the number of waves passing a point in a certain period of time.

Frequency is most often measured in cycles per second (cycle/sec). The base unit for frequency is hertz, abbreviated Hz.

One hertz is equal to one complete wave per second.

Did you know? The human hearing range is 20 Hz ~ 20000 Hz.

Frequency and period

In addition to the musical notes that are pre-set in EdPy, we can also program Edison to play sounds with different frequencies.

To do this, we convert frequencies into periods, which Edison can understand.

A period is how long it takes an acoustic wave to complete a full cycle. Since we are using hertz, we measure frequency in cycles per second.

In acoustics, when period increases, frequency decreases.

Let's look at some examples of how frequency and period relate:

- If a wave has a period of 0.5 seconds, it has a frequency of 2Hz because it can complete 2 cycles in 1 second.
- If a wave has a period of 2 seconds, it has a frequency of 0.5Hz because it can only complete half of a cycle in 1 second.

Converting frequency to period for your program

To get Edison to play a custom frequency, we need to work out the value of the period. This is the number we input into the 'note' parameter in `Ed.PlayTone()`.

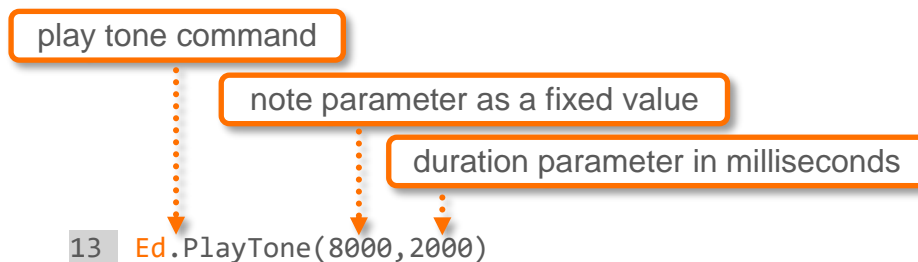
To convert a frequency into a period, divide the number 8,000,000 by the desired frequency. For example, to play a 1kHz (1000 cycles per second) sound:

$$\frac{8000000}{1000} = 8000$$

Your turn:

Task 1: Play a custom tone

Write the following program:



Download and test it to hear what this program sounds like.

Task 2: Play an alarm

In this program, we want Edison to play notes of increasing period.

To make the alarm program, you will need to use a 'for' loop, variables and the range() function. You also need to nest a 'while' loop into the program.

Write the following program:

```

1
2  #-----Setup-----
3
4  import Ed
5
6  Ed.EdisonVersion = Ed.V2
7
8  Ed.DistanceUnits = Ed.CM
9  Ed.Tempo = Ed.TEMPO_MEDIUM
10
11 #-----Your code below-----
12
13 for i in range(33):
14     Ed.PlayTone(100+(i*100), 1000)
15     while Ed.ReadMusicEnd()==Ed.MUSIC_NOT_FINISHED:
16         pass
17
  
```

Download it and test what this program sounds like.

1. What do you hear from the robot? Why is this happening?

An important skill in programming is being able to 'trace' through a program to understand what is happening. Programmers perform a code trace as a method for hand simulating the execution of their code to verify that it works correctly before compiling it manually.

Tracing involves stepping through the program line by line, recording important values. It is often done to help find errors or 'bugs' in code, but it is also useful when you just need to understand what is happening in a program.

Try to 'trace' through what is happening in the program and answer the following questions about the program.

2. Fill in the following table by calculating the period parameter for each given value of 'i' in the above code. The first value is filled in for you.

Value of i	Period parameter [the 1 st input parameter to PlayTone()]
0	100
1	
2	

3. What is the maximum value of i?

4. What is the maximum value of the period parameter input to the PlayTone() function?

5. How many tones are played?

Name_____

Try it!

The application of acoustics in technology is called acoustical engineering.

Try some acoustical engineering of your own. Experiment with modifying the parameters to PlayTone() to make the program play a different combination of sounds.