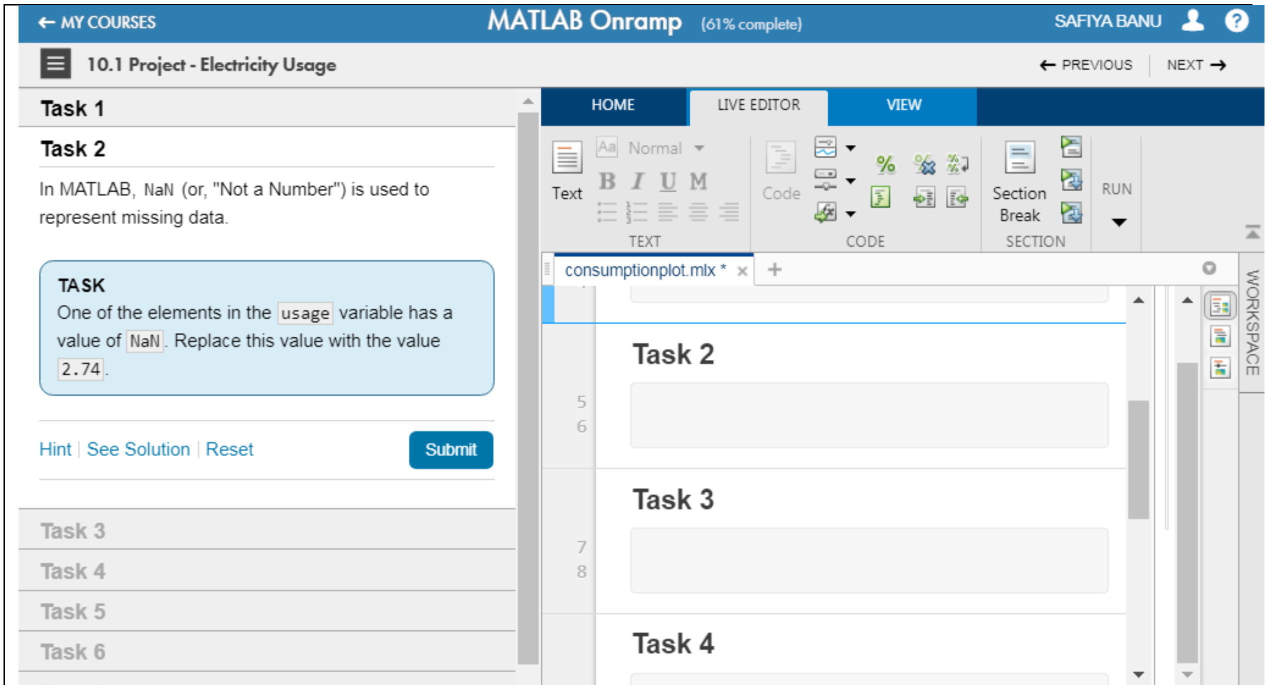
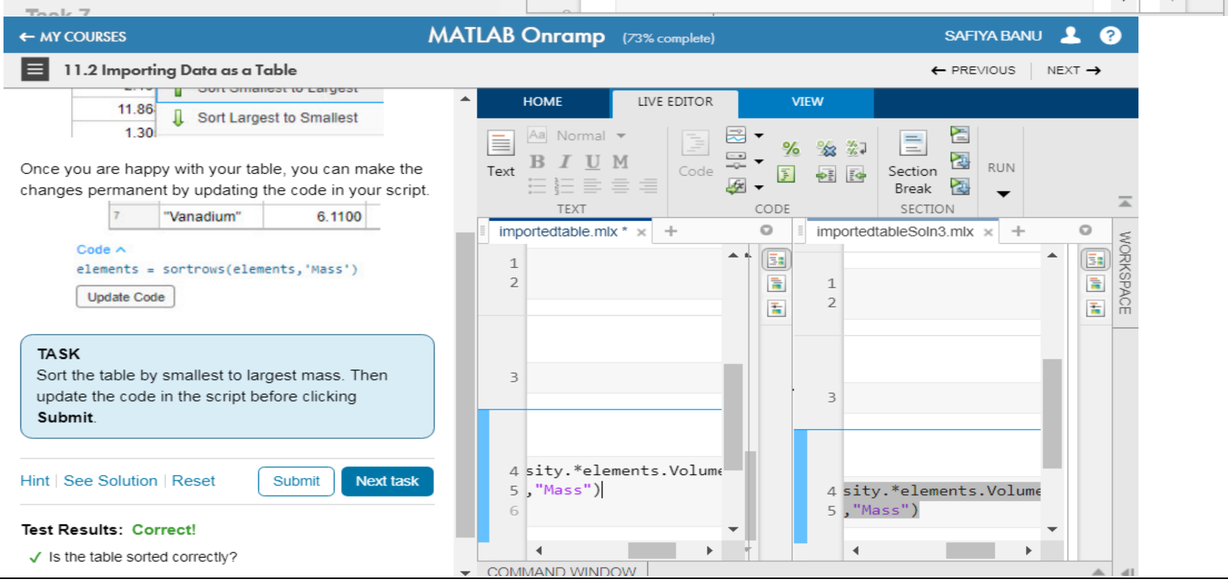
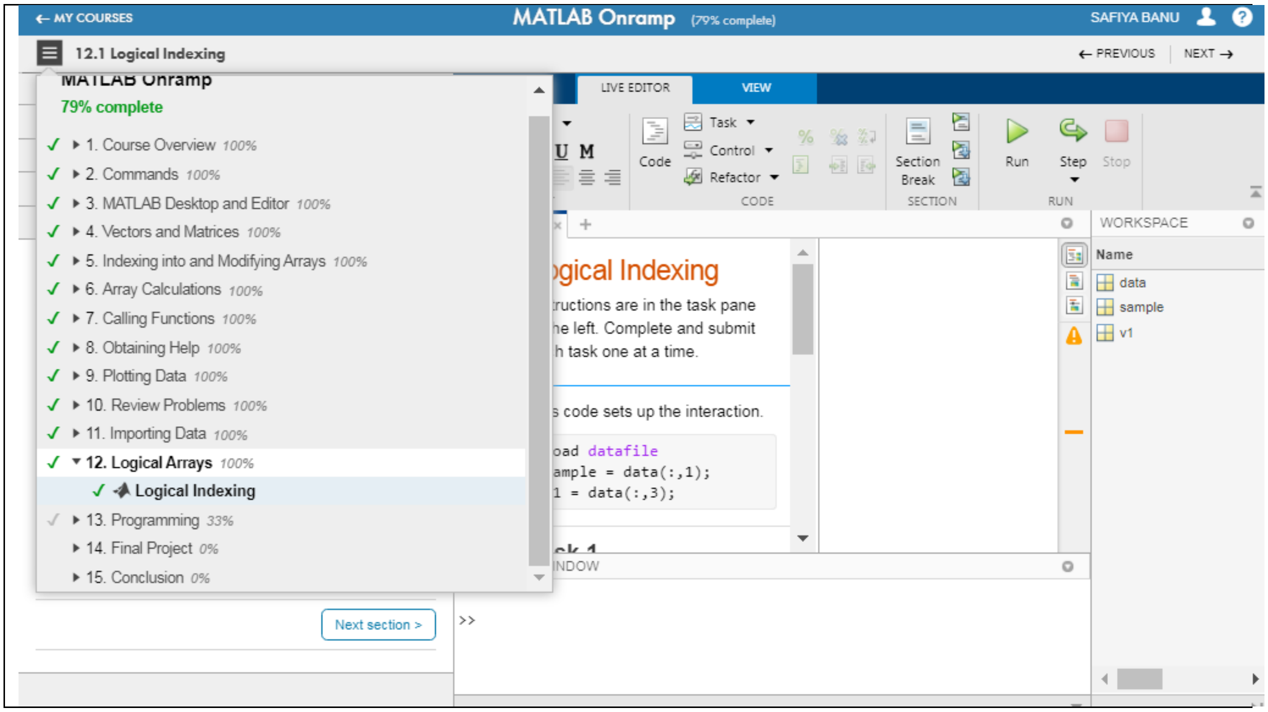
Date:	**9 July 2020**	**Name:**	**Safiya Banu**
Course:	**MATLAB Onramp**	**USN:**	**4AL16EC061**
Topic:	**1. Review problems** **2. Importing data** **3. Logical arrays**	**Semester & Section:**	**8th sem "B"section**
Github Repository:	**Safiya-Courses**		







Electricity Usage

In this project, you will plot electricity usage for various economic sectors - residential, commercial, and industrial. Which economic sector's usage do you think will be the largest?
The usage data represents the US electricity consumption for different years in the month of July. The usage data are in 10^9 kWh/day, and the price data is in US cents per kWh.

Audio Frequency

Audio signals are usually comprised of many different frequencies. For example, in music, the note 'middle C' has a fundamental frequency of 261.6 Hz, and most music consists of several notes (or frequencies) being played at the same time.

In this project, you will analyze the frequency content of an organ playing the C chord.

The C chord consists of the C (261.6 Hz), E (329.6 Hz), and G (392.0 Hz) notes. The highlighted points in this frequency plot correspond to each note.

The C chord recording is stored in a file named `Cchord.mat`. This file contains two variables:

- y: signal from recording
- `fs`: sampling frequency

This task uses the `numel` function to return the number of elements in an array.

Review Problems – Audio Frequency

In the plot, notice that `y` is periodic, but it's not a simple sine wave. It's made up of multiple sine waves with different frequencies.

A Fourier transform will return information about the frequency content of the signal. The location of the dominant frequencies will show what notes are contained in the chord.

You can use the `fft` function to compute the discrete Fourier transform of a vector.

```
fft(y)
```

The output values from `fft` are complex numbers.

You can use the `abs` function to get the magnitude.
n Tasks 1 and 2, you calculated the time vector `t` for the signal `y`. Similarly, you need to calculate the frequency vector `f` for your FFT vector `yfft`.

The vector `f` now contains `n` points. To convert these points to frequencies, you can multiply the entire vector by the sampling frequency (`fs`) and divide it by the number of points (`n`).

`f` will contain frequences from `0` to `fs`. The dominant frequencies are located at the beginning of `f`. You can use the `xlim` function to zoom in on the area of interest.

```
xlim([xmin xmax])
```

Use the data cursor in the output pane to see the frequency locations.

The first three spikes are the notes comprising a middle C chord.

What are the other three spikes? When a chord is played, the signal contains *fundamental frequencies* and the associated *harmonics*. In this case, the harmonics are another octave of the same chord.

Using the frequencies in the table below, you can see that the 6 spikes in the plot correspond to the fundamental frequencies and the first harmonics of a middle C chord.

Note	Frequency
C_4	261.6
E_4	329.6

G_4	392.0
C_5	525.3
E_5	659.3
G_5	784.0