Austin Wilmoth   PreLab8   February 25, 2019

1. An example of a toy would be a kids monophonic piano, meaning only one key can be played at once. If you press any key on the keyboard a specific note is plays. Depending on how long the key is pushed the longer the note will play, but also if you push to long the note will stop playing either way. If you press the change sound mode the sounds that are played change.

2. The way that this would probably work on the micro controller would by having each key mapped to a specific interrupt and when that interrupt is made a sound file would be pulled from data memory and played. There would also be a timer set up to account for how long the note will play. Either when the key is no longer pressed the timer will be compared or when a specific set of time is hit while holding it down. This would be done by having the timer count up to ocrx but if the key is no longer being pushed then the timer will to be set to overflow then. The changing of sounds will work by having an interrupt called that moves the sounds in the current data memory that they board is looking at and puts a new one in its place.

3. The UDRE flag is used to detect if the transmit buffer is empty meaning that all data has finished being transmitted. It is set to 1 if the buffer is empty. The main difference to TXC, as it does the same thing as UDRE is that it is used when the microcontroller needs to receive data as soon as the transmission is done. By seeing that this flag is set it knows to immediately start receiving data.

4. The flag that is used to indicate the current receiver state is called RXCn. For USART1 specifically the flag is called RXC1. It is located in the register UCSR1A and the interrupt vector address is located in memory location $003C.