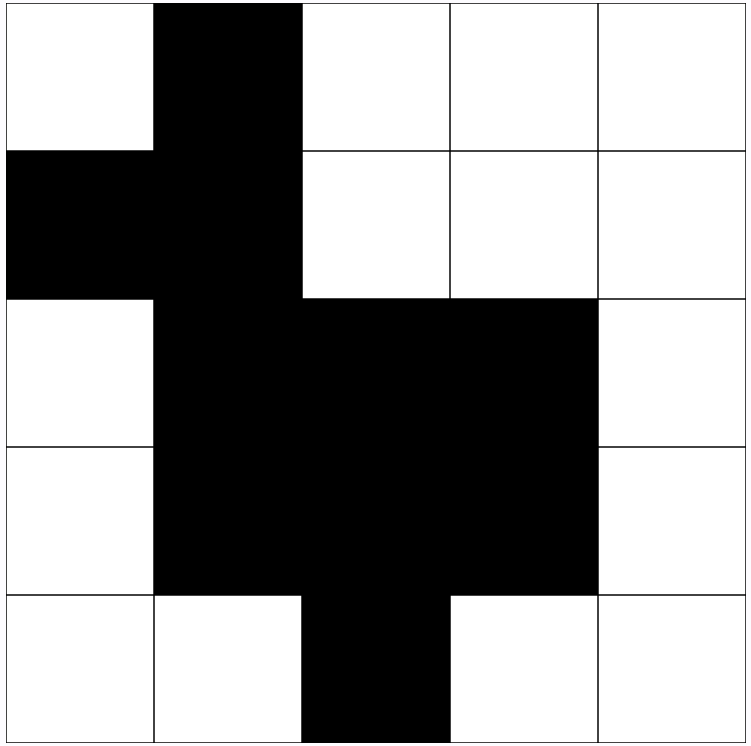
Information Layer

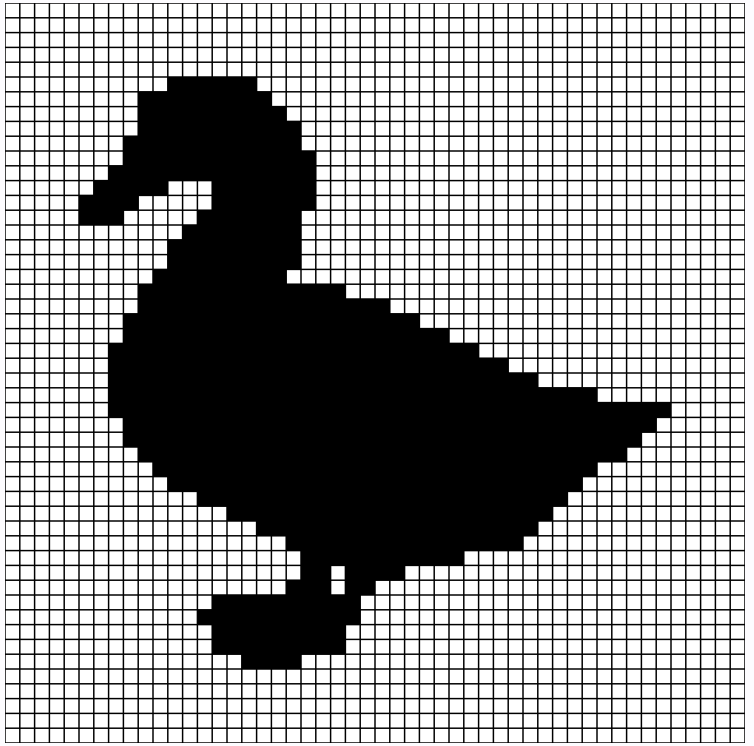
AP CSP @ SouthLake Christian Academy

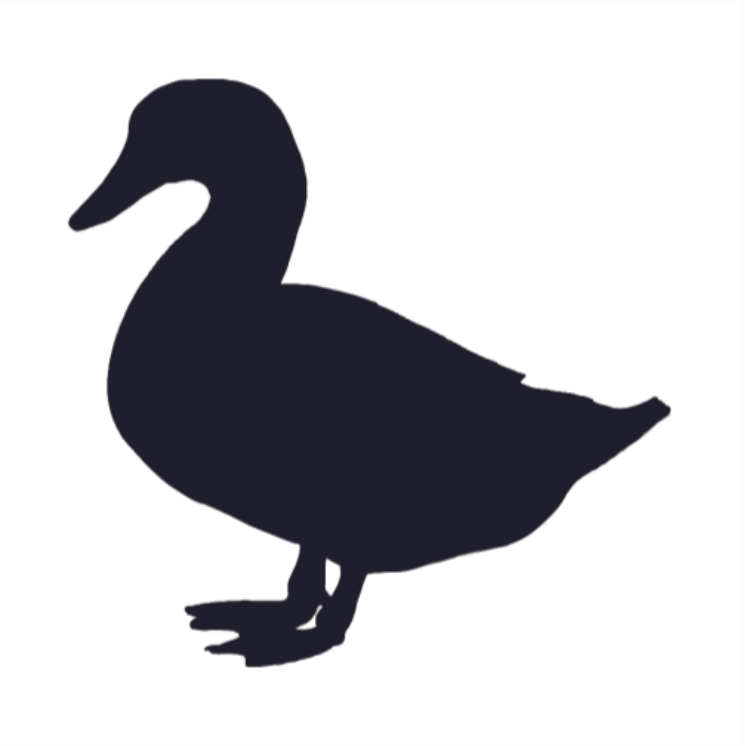
Analog and Digital Data

- **digital data**: data represented as `0`s and `1`s
  - defined at a set time interval
- **analog data**: data represented as a continuous signal

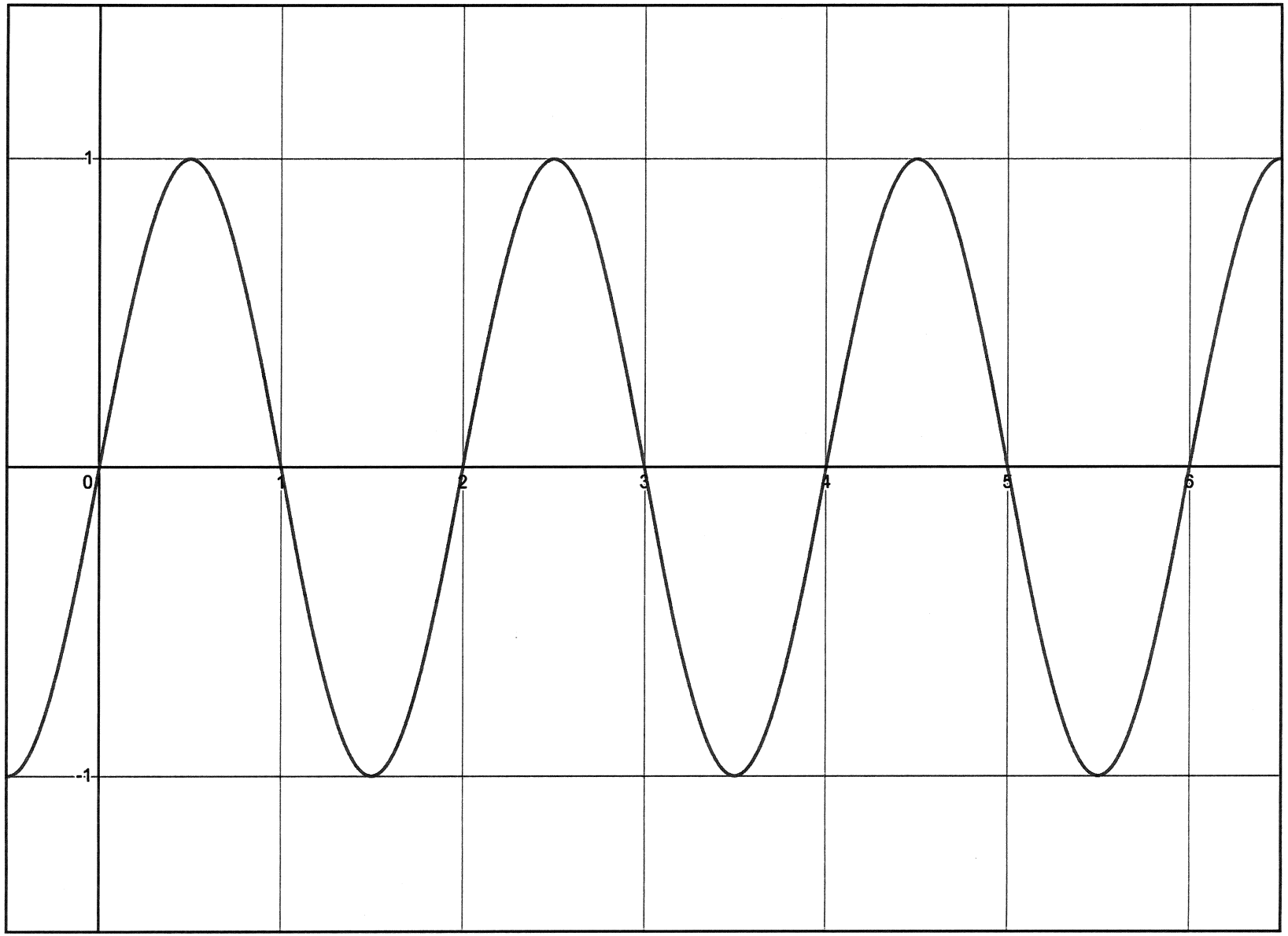
We can represent analog data as digital data, but the computer will have to approximate.





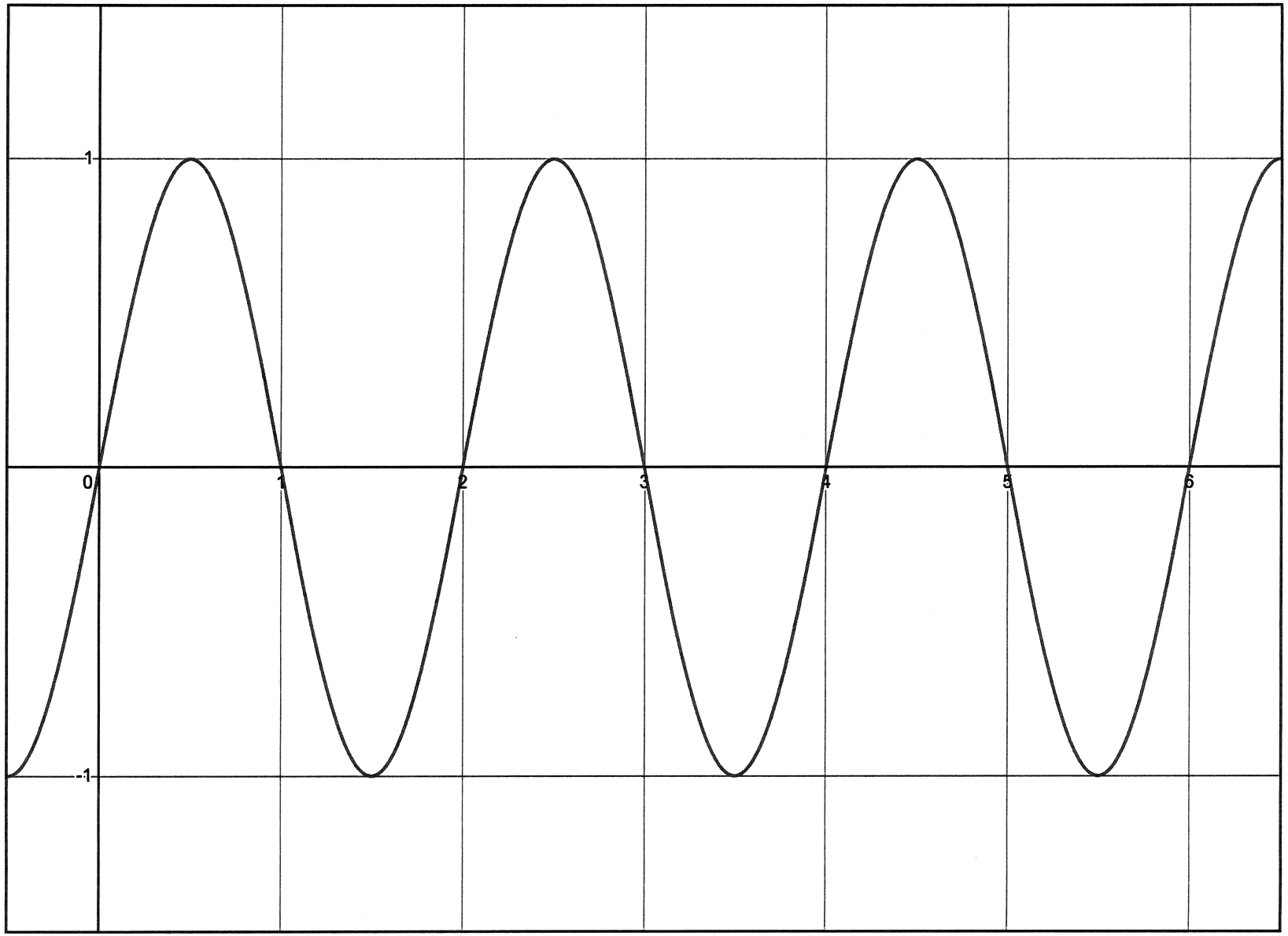


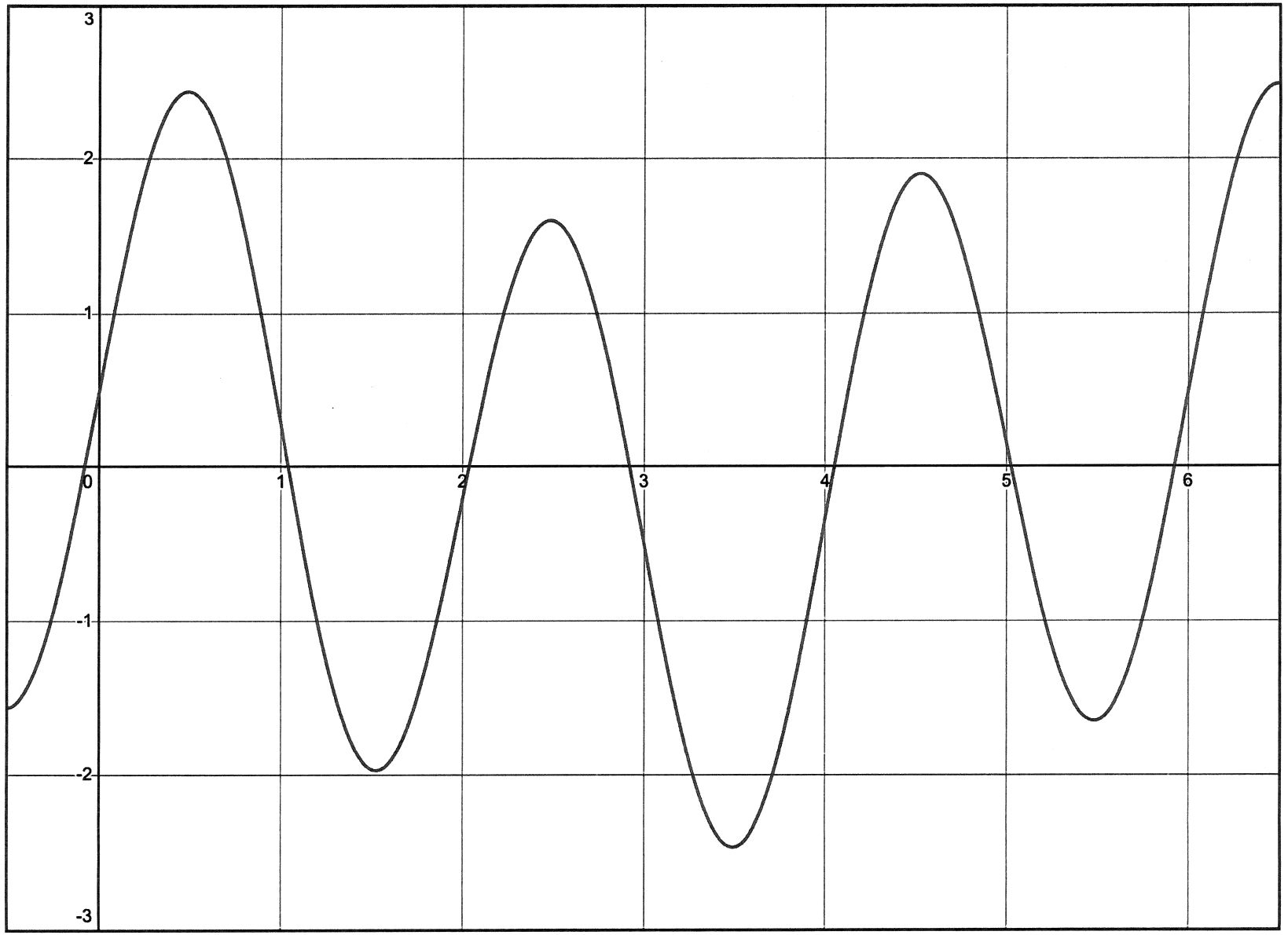
We can get closer and closer to the real duck, but will never be able to fully and accurately represent the duck on a machine.


1
0
1
2
3
4
5
6
-1

Audio Format Parameters

- **sampling frequency:** number of times per seconds we take a digital snapshot of what a person would hear
  - often measured in kilohertz (1000 samples a second)
- **bit depth**: number of bits used in each snapshot
- sampling frequency x bit depth = number of bits for one second of music


1
0
1
2
3
4
5
6
-1


3
2
1
0
1
2
3
4
5
6
-1
-2
-3

1-bit deep

`0b0`	`0b1`
off	blaring

2-bit deep

`0b00`	`0b01`	`0b10`	`0b11`
off	whisper	comfy	blaring

If your song is recorded in a 32-bit audio format, and your song was recorded at 44.1kHz (44100 samples a second), how many bits are required to store your 7 minute song?

Audio Formats

- MIDI: **M**usical **I**nstrument **D**igital **I**nterface
  - way to describe pitch and duration of note
  - computer synthesizes these notes
  - not an actual recording
- For *recorded music*, MIDI, AAC, MP3, WAV formats
  - WAV is uncompressed → high quality
  - MP3 is compressed → lower quality
    - Which type of compression?

Image Formats

- GIF: **G**raphics **I**nterchange **F**ormat
  - low-quality, 8-bit color, can be animated
- JPEG → lossy compression, 24-bit color
- PNG → lossless compression, 24-bit color
- SVG describes equations

Metadata

metadata: data about data

image formats will contain not only the raw binary data, but also information about:

- when the image was created
- when the image was last modified
- when the picture was taken
- where the picture was taken
- the size of the image
- the type of color scheme used
  - black and white, or color