

Storage in binary – Sound

To calculate the file size of a sound track, the following need to be considered:

- Sample rate
- Bit depth
- Number of channels (mono or stereo)
- Length of the recording

*Sound file size = sample rate * Bit depth * Length of recording * Number of channels*

Sampling = Recording analogue sound, at regular intervals and converting each snippet of sound to a binary value.

The **sampling rate** is the number of samples taken each second.

Bit depth is the number of bits used to store each sample.

Bit rate = Sampling rate x Bit depth x Number of channels

Example

The size of a **3 MINUTE** stereo audio file with a sample rate of 44,100 per second and a bit-depth of 16 bits would be:

$$\begin{aligned} 44,100 \times 16 \times 2 \times 180 &= 254,016,000 \text{ bits. (Divide this by 8 to get bytes)} \\ &= 31,752,000 \text{ bytes} \\ &= 31.752 \text{ Mb} \end{aligned}$$

BEWARE: Before you start multiplying, ensure that all data is in bits and seconds. After every step write the unit for the result.

1. How much space is required to save a 2 minute audio clip with a sample rate of 4,000 bits per second and bit-depth of 8?
2. How does the sample rate affect the quality of the sound track?
3. How much space is required to save a 20 second audio clip with a sample rate of 4,000 bits per second and bit-depth of 8?
4. Calculate the size of an audio file of a song lasting five minutes which is sampled in stereo at a rate of 41,100 samples per second and a bit depth of 24 bits.
5. What is the difference between sample rate and bit depth?
6. Why doesn't a digital recording of a piece of music contain all of the sound available?

Analog – Digital Converter (ADC)

Digital-Analog Converter (DAC)