# Exercise 02 - Group B

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# Task 2.1

## Sound & Audio

Q: How do sound and audio differ from each other?

# Task 2.1

## Sound & Audio

A: While **sound** represents a more abstract concept of a physical and psychophysical phenomenon, **audio** describes sound that can be auditory perceived by the human ear

# Task 2.1

## Sound & Audio

Q: What does ‘sound’ mean in a psychophysical sense?

# Task 2.1

## Sound & Audio

Q: In terms of psychophysiology, sound is the **reception** of an audible wave of pressure, which is then **perceived** in the human brain through factors like pitch, loudness and timbre

# Task 2.1

## Properties of Sound

A: What does ‘timbre’ mean?

# Task 2.1

## Properties of Sound

A: In other words, ‘timbre’ describes the tone color or tone quality. Essentially, timbre is what makes a particular sound distinguishable from another one

# Task 2.1

## Properties of Sound

Q: What **type** of wave is a sine wave?

# Task 2.1

## Properties of Sound

A: A sine wave is a **continuous wave**, meaning it has a constant amplitude and frequency and is periodic

# Task 2.1

## Mathematical Representation

Q: What is a **sinusoid** and how is it expressed mathematically?

# Task 2.1

## Mathematical Representation

A: A sinusoid describes a general form to create a sine wave and is expressed by the from: $\mathbf{y = A \sin(2\pi f t + \phi)}$

# Task 2.1

## Mathematical Representation

Q: How does a cosine wave differ from a sine wave?

# Task 2.1

## Mathematical Representation

A: A cosine wave is the same as a sine wave except with a **phase shift**. For an individual sinusoidal function, a phase shift is the same as a time delay

# Task 2.1

## Digital Representation

Q: By which factors is the signal quality controlled?

# Task 2.1

## Digital Representation

A: The **sampling rate** and the **bit depth** control a signal's quality

# Task 2.1

## Digital Representation

Q: What do these factors describe?

# Task 2.1

## Digital Representation

A: **Sampling rate** describes the number of samples per second, while the **bit depth** describes the quantity of bits of information in each sample in discrete values

# Task 2.1

## Audio Programming

Q: What effect does a higher bit depth have?

# Task 2.1

## Audio Programming

A: The more bits, the more **dynamic** the range in audio is

# Task 2.1

## Audio Programming

Q: What does the Nyquist-Shannon-Theorem say?

# Task 2.1

## Audio Programming

A: The sampling frequency must be greater than twice the maximum frequency one wishes to reproduce i.e. a sample rate of 44.1 kHz will accurately represent frequencies up to 22kHz (the range of human hearing)

# Task 2.2

1. How fast travels sound through different media?
2. What attributes influence the speed of sound?
3. What loudness causes hearing damage?
4. What is white noise?
5. What is phase shifting in audio?

# Task 2.2

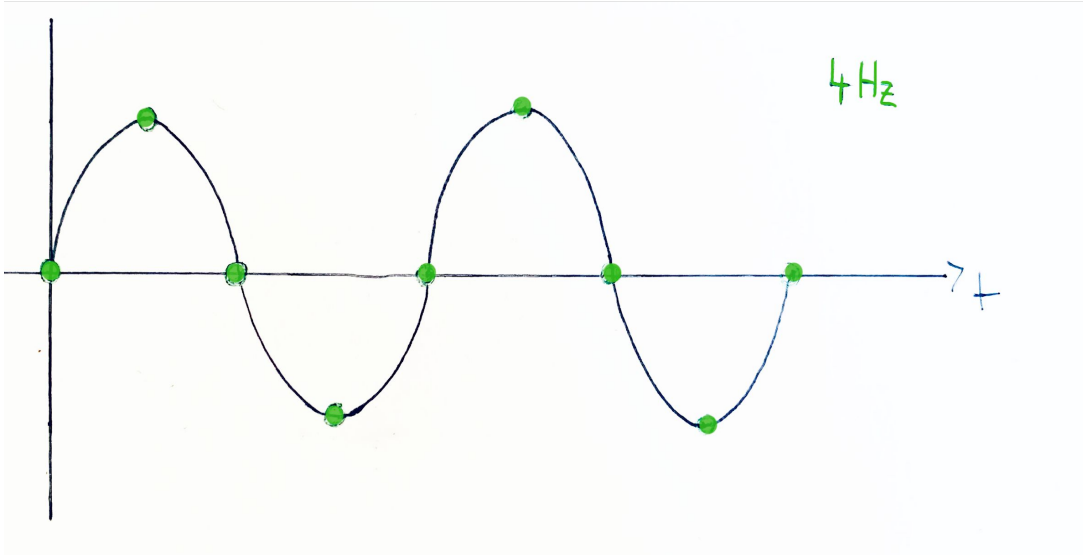
6. What does phase shifting sound like?
7. Is the sampling rate for audio streaming different than 44,1kHz?
8. How to minimize quantization errors?
9. How to generate the octave of 440 Hz?
10. Do you have to clear the audiobuffer before generating a new sound?

# Task 2.3

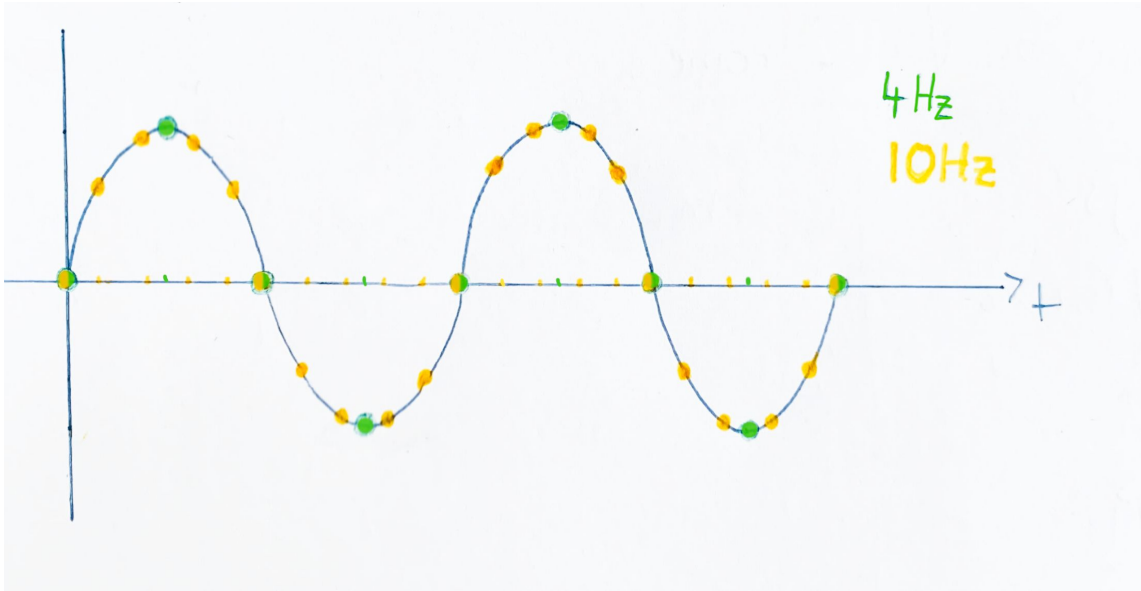
PODCAST 

Examples:
- 48kHz and 32bits
- 48kHz and 4bits
- 6kHz and 32bits
- 6kHz and 4bits

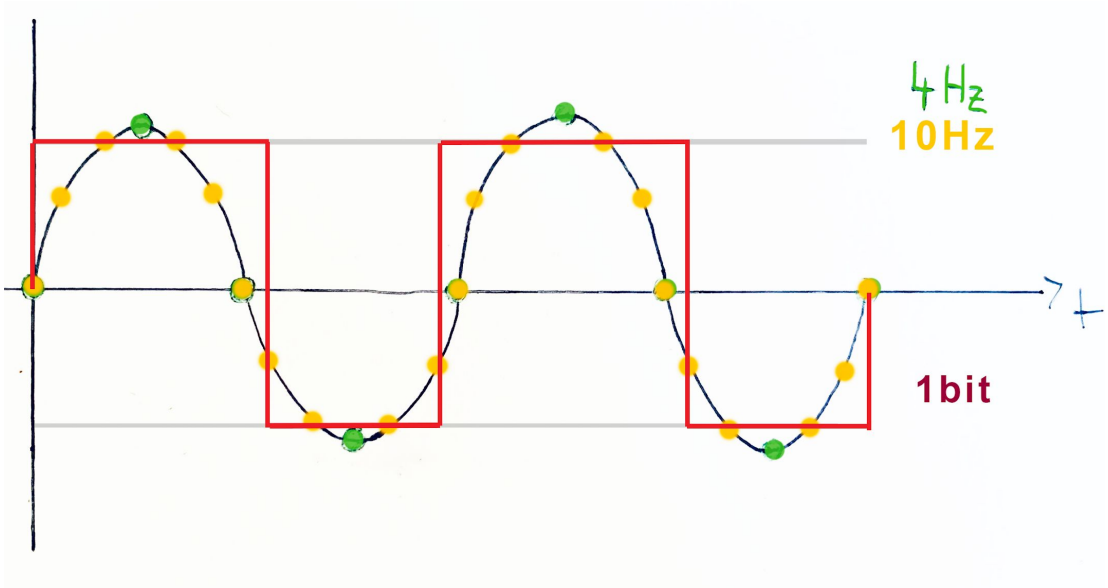
# Task 2.4



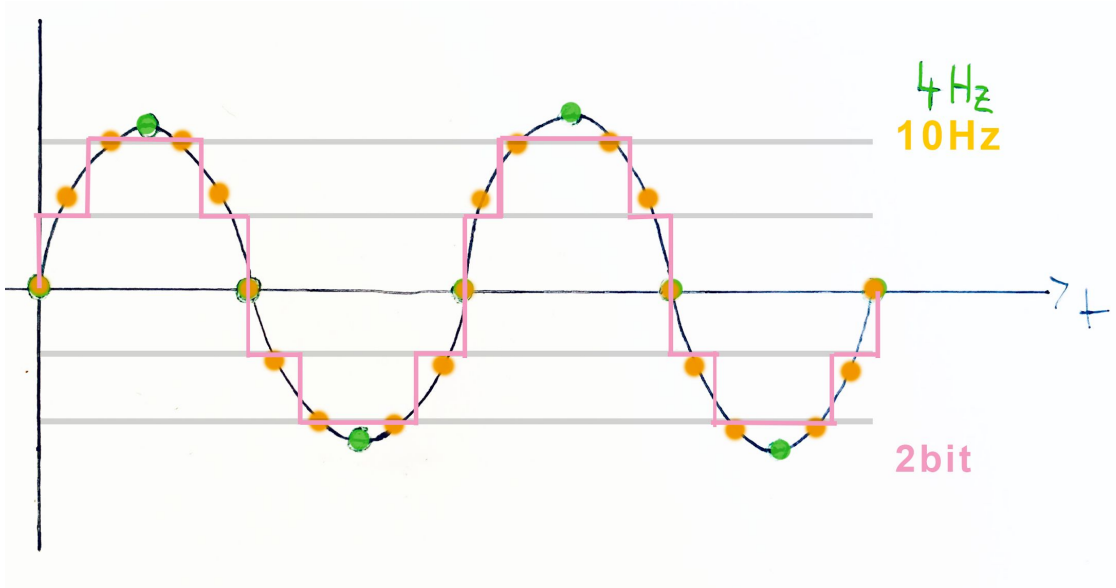
# Task 2.4



# Task 2.4



# Task 2.4



# Task 2.4