Exercises on Audio Storage

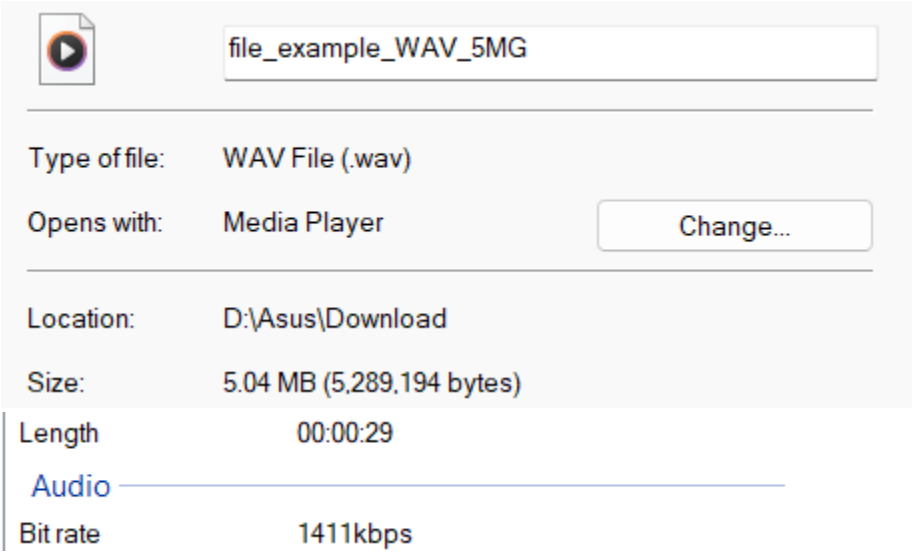
1. Distinguish Audio Formats

	MP3	WAV	FLAC	AAC
Advantages	**+ Wide Compatibility:** Virtually all digital audio players, smartphones, and software are supported. **+ Small File Size:** Efficient compression leads to smaller file sizes, making it ideal for storage and streaming. **+ Reasonable Quality:** At higher bit rates (e.g., 320 kbps), the audio quality is generally good and sufficient for most listeners.	**+ High Quality:** WAV files are uncompressed and lossless, providing high-fidelity audio. **+ Editing Flexibility:** Ideal for professional audio editing and processing, as the files contain raw audio data.	**+ Lossless Compression:** Retains all the original audio data, ensuring high-quality sound. **+ Smaller File Size Than WAV:** Although lossless, FLAC files are compressed, making them more storage-efficient than WAV. **+ Metadata Support:** FLAC files support metadata tagging, which is useful for organizing music libraries.	**+ Better Quality at Lower Bit Rates:** Offers superior sound quality compared to MP3 at similar or lower bit rates. **+ Widely Used in Streaming:** Preferred format for many streaming services due to its efficiency. **+ File Size:** Efficient compression leads to smaller file sizes compared to MP3 at comparable quality levels.
Disadvantages	**+ Lossy Compression:** Some audio data is lost during compression, affecting sound quality, especially at lower bit rates. **+ Not Ideal for Archiving:** Due to its lossy nature, MP3 is not the best choice for preserving high-fidelity audio.	**+ Large File Size:** WAV files are significantly larger than compressed formats, making them less suitable for storage and streaming. **+ Limited Compatibility:** While widely supported, they are not as universally compatible as MP3s for	**+ Larger File Size Than MP3/AAC:** Although compressed, FLAC files are larger than MP3 and AAC files. **+ Variable Compatibility:** While support is growing, FLAC is not as universally compatible as MP3, especially on older or less common devices.	**+ Compatibility Issues:** Not as universally supported as MP3, although support is broad and growing. **+ Lossy Compression:** Like MP3, it is a lossy format, meaning some original audio data is discarded.

		everyday use on portable devices.		

2. Convert Audio Formats

Before Conversion:



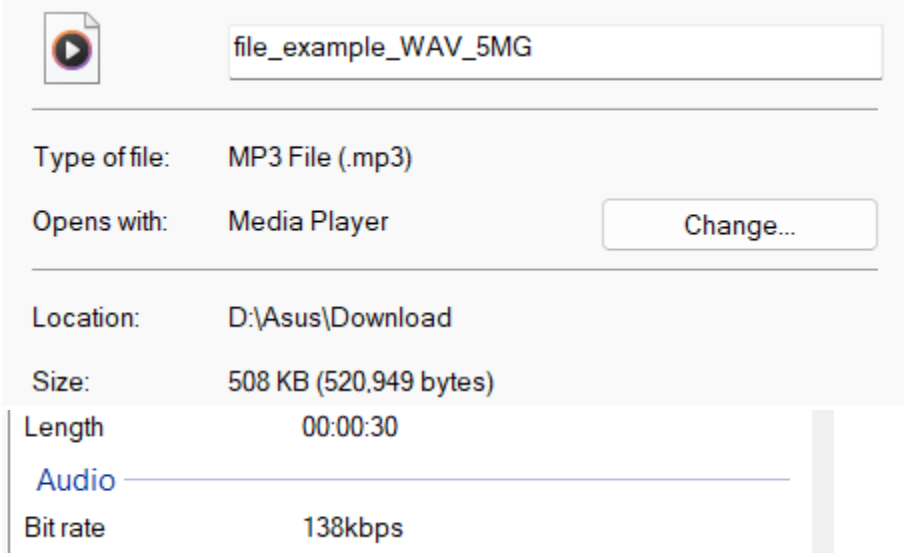
File Format: WAV

File Size: 5 MB (for a 30-second song)

Bitrate: 1411 kbps (uncompressed)

Audio Quality: High fidelity, no compression artifacts

After Conversion:



File Format: MP3

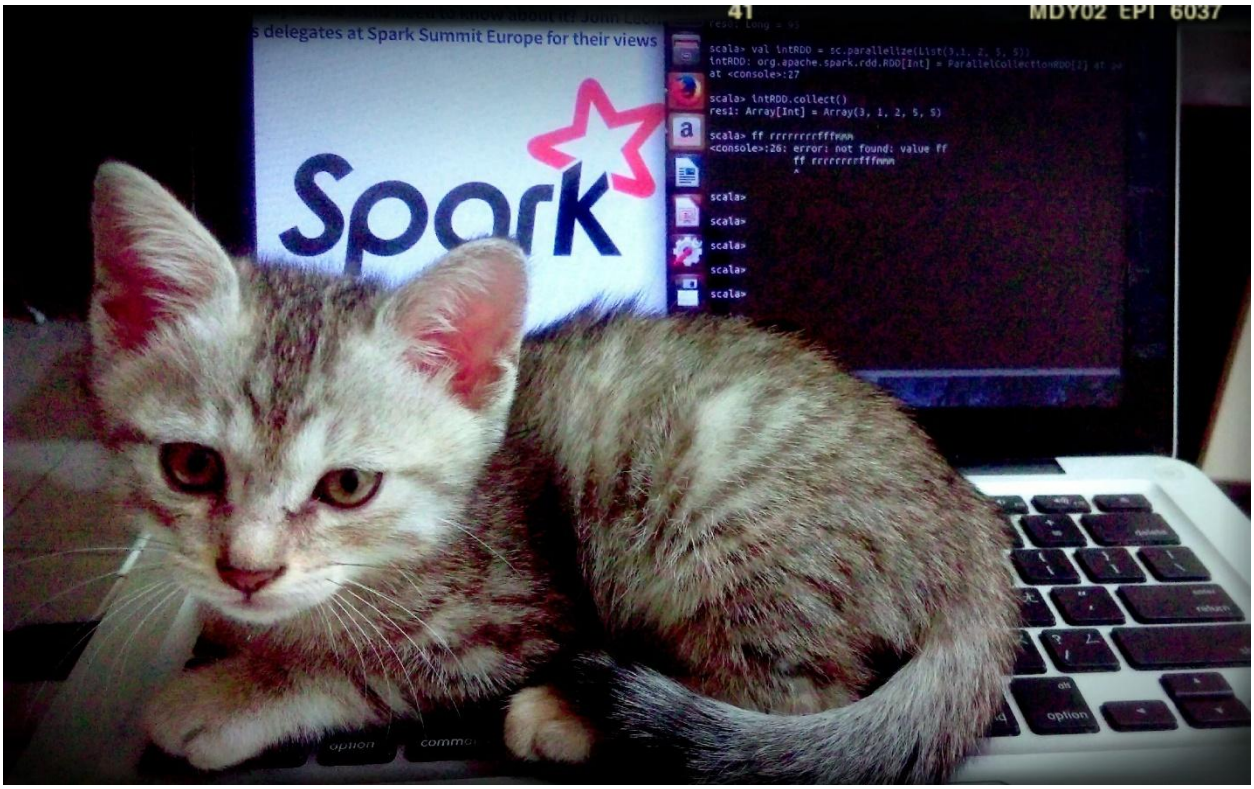
File Size: 509 KB (for a 30-second song at 138 kbps)

Bitrate: 138 kbps (compressed)

Audio Quality: Reduced fidelity, potential compression artifacts, especially in high frequencies or complex passages

Exercises on Image Storage

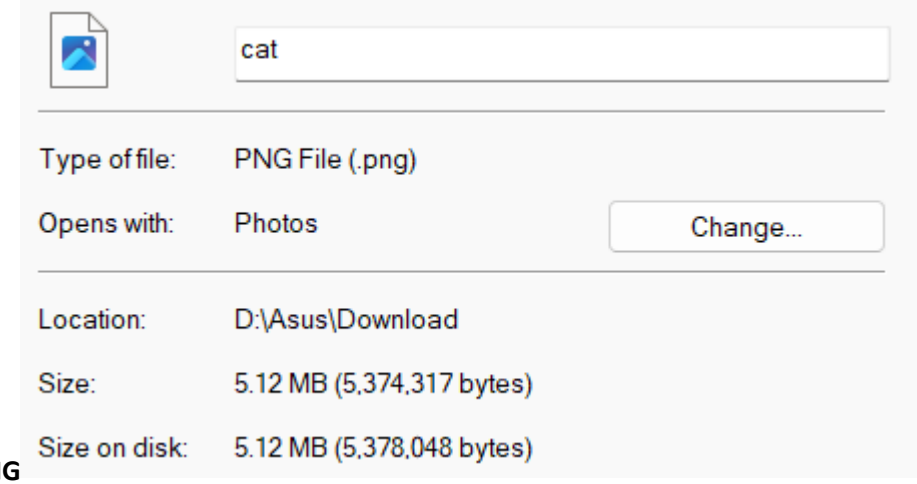
3. Analyze Image Quality



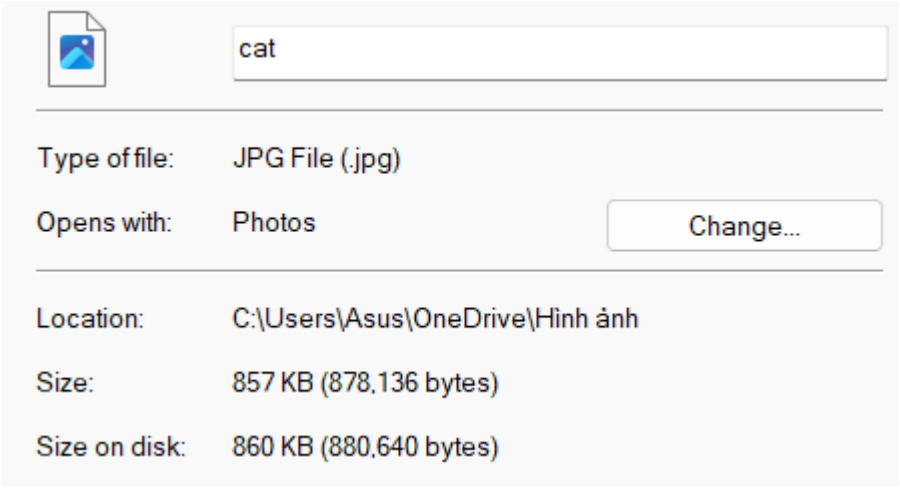
Format	File Size	Sharpness	Color	Resolution
JPEG	858KB	Good, may have artifacts	Good, may degrade	Preserved, minor detail loss
PNG	5MB	Excellent	Excellent	Fully preserved
GIF	2MB	Good	Limited to 256 colors	Maintained, color limitations
BMP	12MB	Excellent	Excellent	Fully preserved
TIFF	12MB	Excellent	Excellent	Fully preserved

4 Compress Images

Before compression

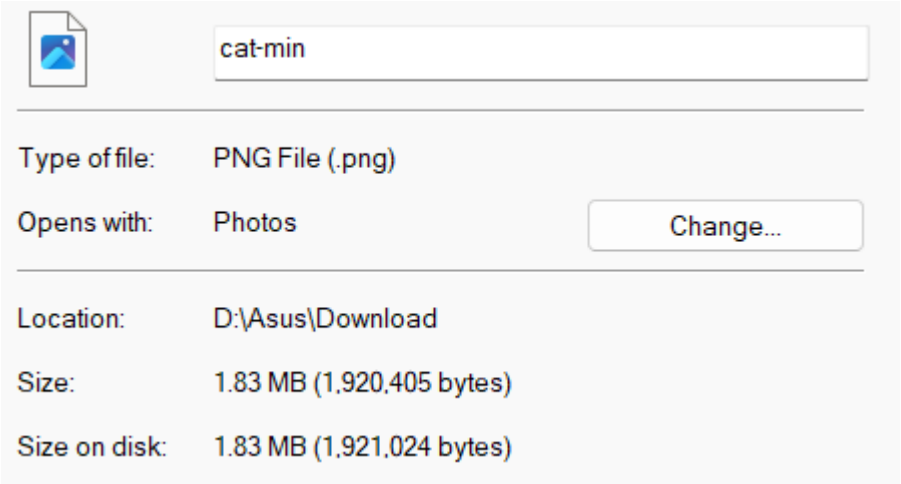


PNG

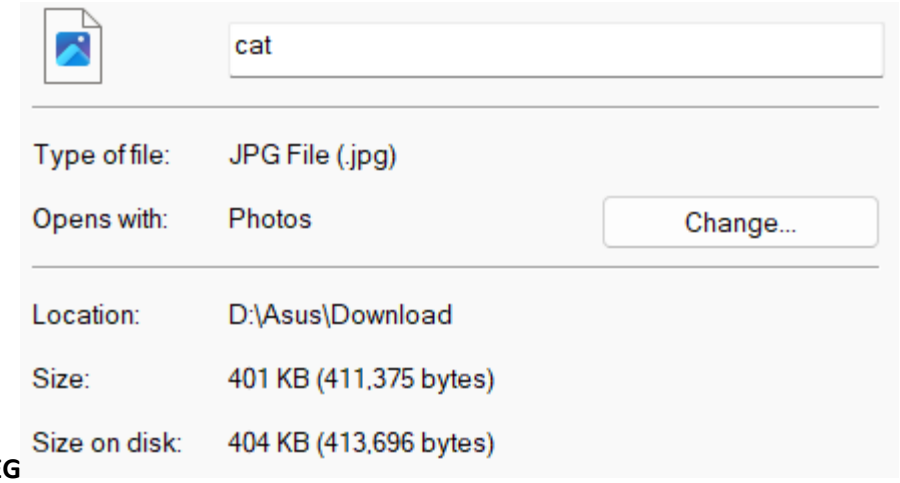


JPEG

After compression



PNG



JPEG

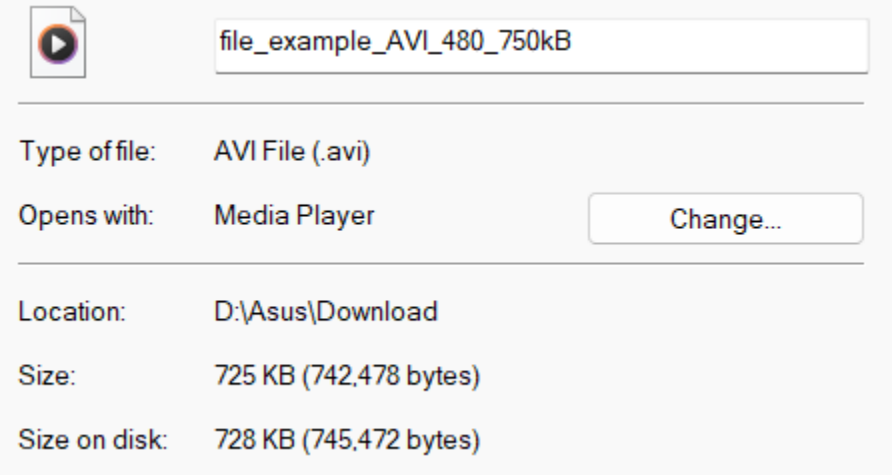
Format	Original Size	Compressed Size	Reduction	Percentage Reduction
PNG	**5,12MB**	**1,83MB**	**3,29MB**	**64,2%**
FPEG	**867KB**	**404KB**	**463KB**	**53,4%**

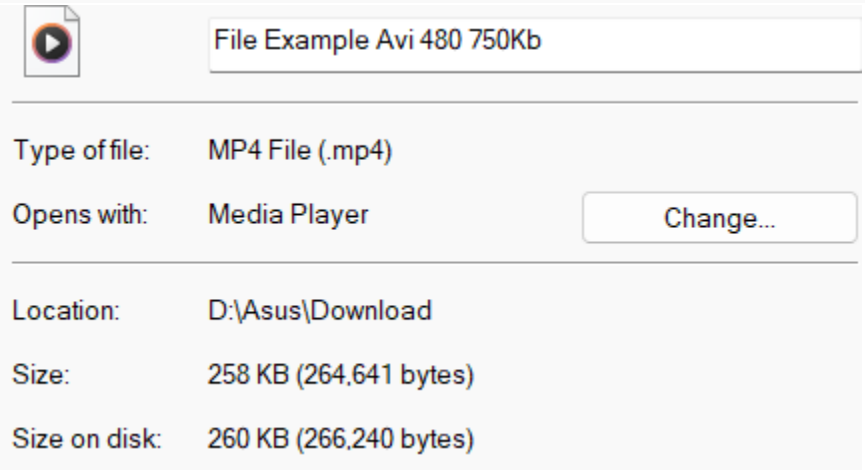
Exercises on Video Storage

5. Compare Video Formats

Format	Pros	Cons	Common Application
MP4	Widely compatible, efficient compression, supports various features	Less suited for editing, potential licensing fees	Online streaming, mobile playback, digital cameras
AVI	High quality, easy to edit, widely supported by media players	Large file sizes, limited mobile/browser support, lacks advanced features	Professional editing, high-quality archiving, desktop playback
MKV	Flexible, high-quality, open standard	Limited compatibility, larger file sizes	Blu-ray/DVD rips, high-definition storage, media servers
MOV	High quality, great for editing, supports multiple tracks	Apple-centric, larger file sizes	Professional production, Apple devices, high-quality archiving
WMV	Efficient compression, well-supported on Windows, good for streaming	Quality loss, limited non-Windows support, possible licensing fees	Windows playback, online streaming, limited storage

6. Convert Video Formats





Aspect	AVI	MP4
File Size	726KB	258KB
Resolution	480x270	480x270
Compression	Minimal (DivX/Xvid)	Efficient (H.264)
Quality	High	High
Compatibility	Limited	Wide

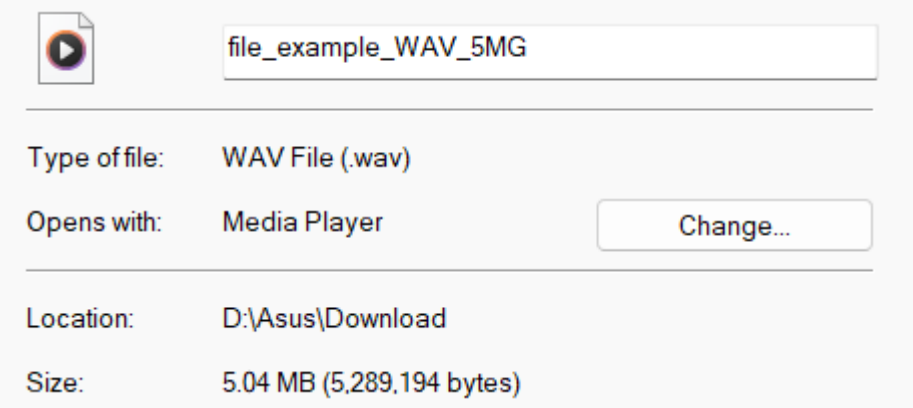
Comprehensive Exercises

7. Create and Manage Metadata

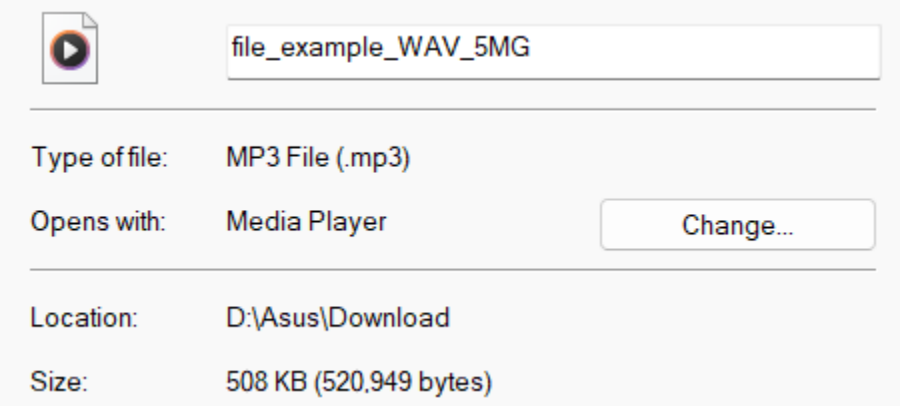
```
ExifTool Version Number         : 12.78
File Name                       : King Ly Thai To.jpg
Directory                       : D:/Asus/Download
File Size                       : 287 kB
File Modification Date/Time     : 2024:05:17 21:18:27+07:00
File Access Date/Time           : 2024:05:17 21:21:16+07:00
File Creation Date/Time         : 2024:05:17 21:18:27+07:00
File Permissions                : -rw-rw-rw-
File Type                       : JPEG
File Type Extension             : jpg
MIME Type                       : image/jpeg
JFIF Version                    : 1.01
Resolution Unit                 : None
X Resolution                    : 72
Y Resolution                    : 72
Exif Byte Order                 : Big-endian (Motorola, MM)
Exif Image Width                : 960
Exif Image Height               : 1280
Profile CMM Type                : Apple Computer Inc.
Profile Version                 : 4.0.0
Profile Class                   : Display Device Profile
```

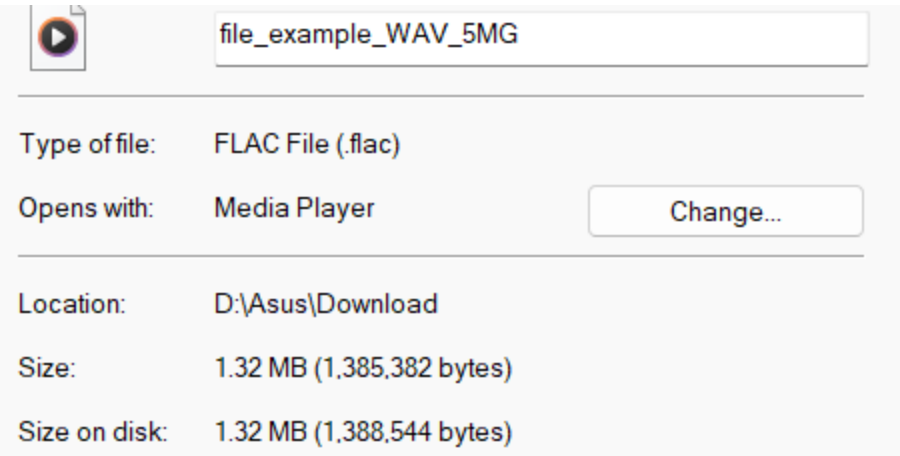
8. Lossy and Lossless Compression

Before



After





1. **WAV (Original):**
    - **Quality: High**
    - **Pros: Uncompressed, best audio quality.**

- **Cons: Large file size.**

2. **MP3 (Lossy):**
    - **Quality: Good, with some quality loss due to compression.**
    - **Pros: Significantly reduced file size, widely supported.**
    - **Cons: Some loss of fidelity, noticeable in high-quality audio systems or to trained ears.**
    - **Artifacts: Possible compression artifacts, especially at lower bitrates.**
3. **FLAC (Lossless):**
    - **Quality: Identical to original.**
    - **Pros: Reduced file size without any loss of quality, supports metadata.**
    - **Cons: Larger file size compared to MP3, but much smaller than WAV.**

<u>Advanced Exercises</u>

9. Create a Video Project

10. Analyze Compression Efficiency