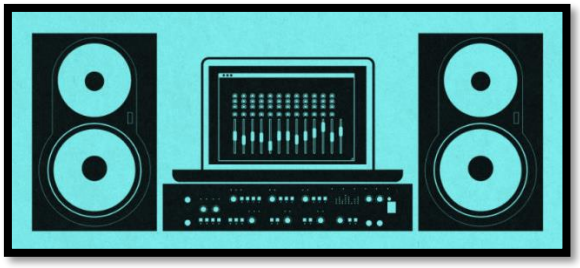
ncfe music technology revision guide.



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The DAW

DAW stands for Digital Audio Workstation. Logic Pro X, Cubase, Ableton Live and Pro Tools are all examples of **software** DAWs. They contain what we call **VST**, which stands for Virtual Studio Technology. This enables them to include synthesisers and effects, for example.

Before DAWs were invented in the late 1980s, sound engineers used to produce music on **hardware** multitrack recorders.

	Hardware multitrack recorder	DAW software
Pros	• Real, tangible • Easier to use in real-time mixes	• Integrates more technology • Allows a lot more detail and control • Cheaper
Cons	• Can break • Lacks controls • Can be very expensive	• Dependent on updates • Can be very complex to use

Parts of the DAW

a. Tracks (audio or MIDI)
b. Regions
c. Play-head
d. Playback section
e. Track controls (Mute, Solo, Record, Volume)
f. Software instruments library
g. Mixer window
h. Audio region

Signal Flow

All sound you record must go through a chain, which we call the signal flow. A variety of analogue, digital and MIDI cables will be used for this.

USB to 5 pin MIDI / DIN

- MIDI cable
- Carries **data** from MIDI instrument to computer

TS Jack

- Analog audio **unbalanced** cable
- Carries **mono** sound signal to amp, speakers, mixing desk, audio interface

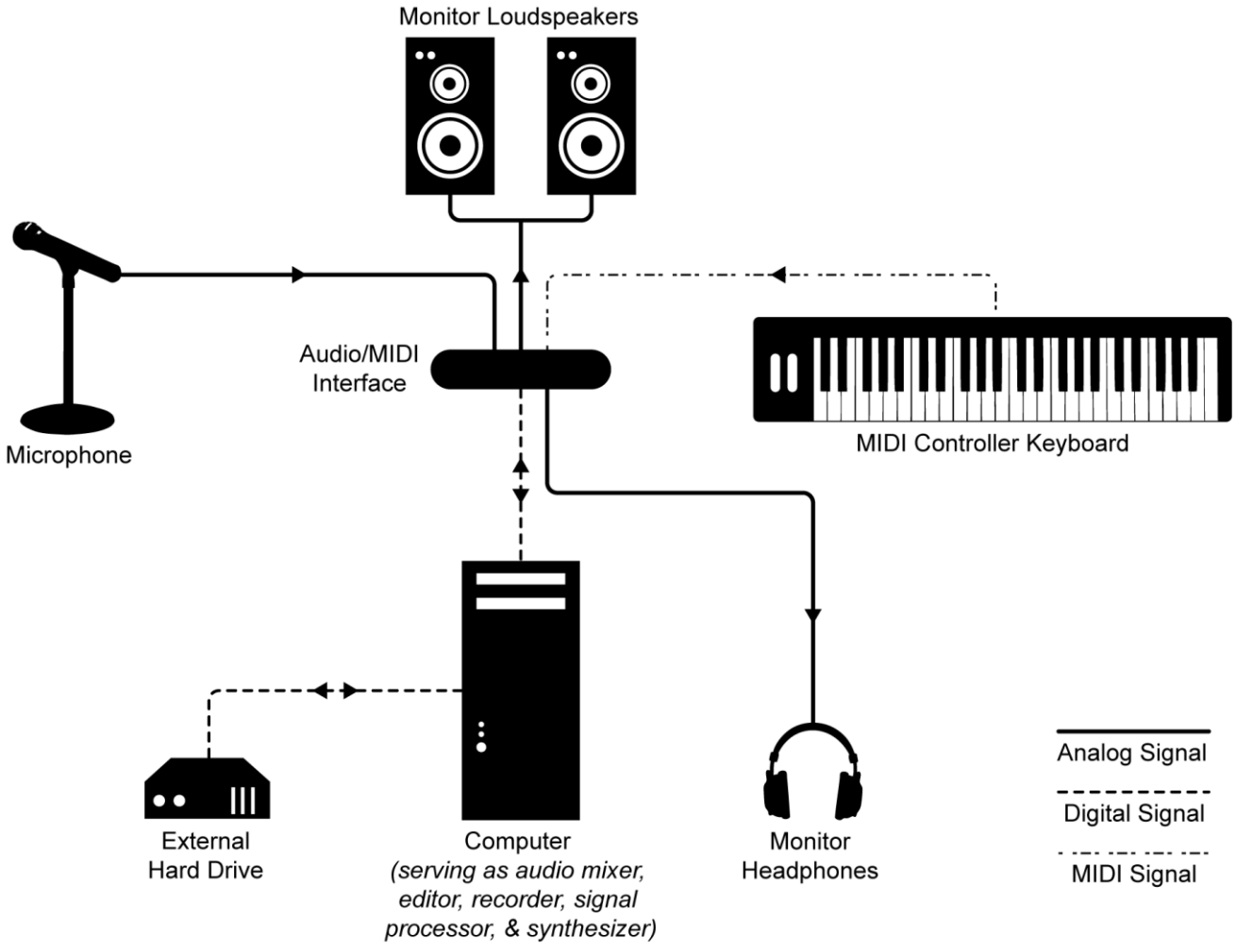
TRS Jack

- Analog audio **balanced** cable

Carries **stereo** sound signal to amp, speakers, mixing desk, audio interface

XLR

- Analog audio **balanced** cable
- Carries **stereo** sound signal to amp, mixing desk, audio interface.
- Can carry **phantom power**



MIDI Controllers

MIDI controllers come in all shapes and sizes. They often represent an instrument (keyboard, guitar, saxophone) although sometimes they are made only of faders, pads and knobs.

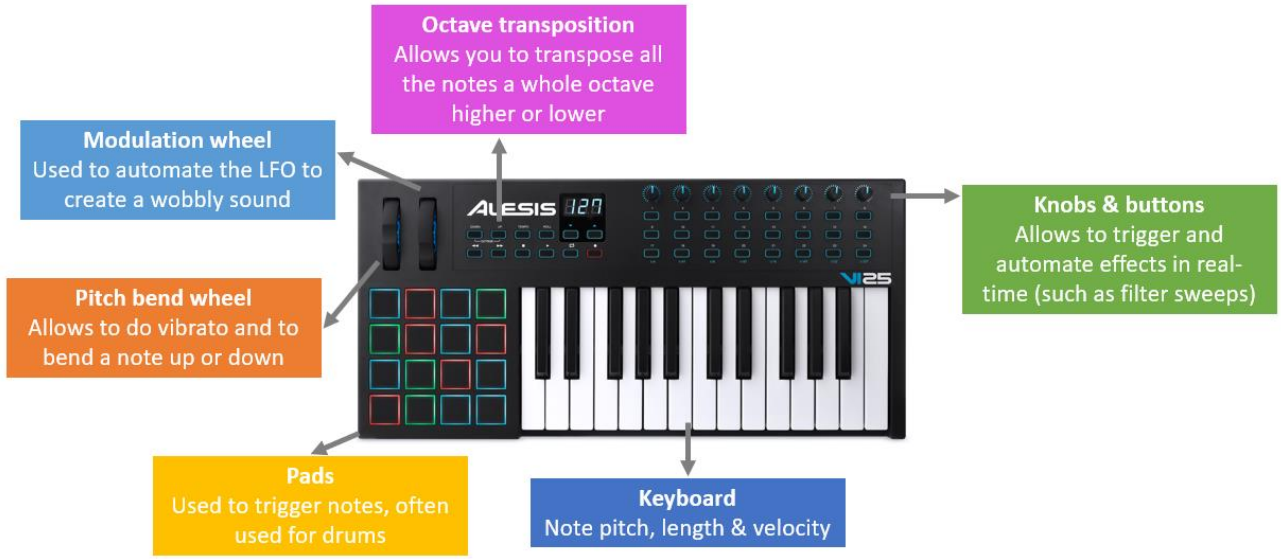
How they work

MIDI controllers **input data** into the computer via a MIDI or USB cable. They will transfer information such as:

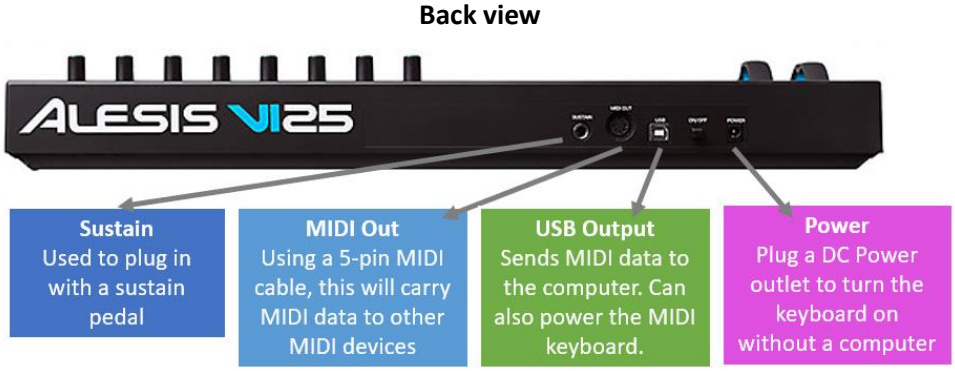
- Note / pad played (on/off)
- Note velocity (how hard you press on the key)
- Modulation
- Pitch bend
- Transposition

Controls

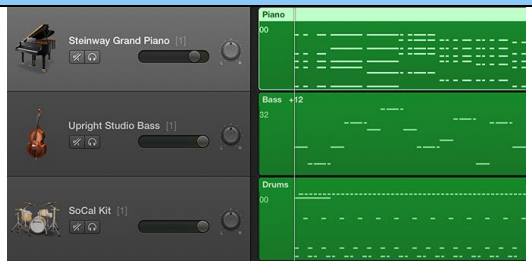
Front view



Back view



Audio tracks VS software instruments

Audio tracks	Software instruments
 • Typically, a **real** instrument or voice • Could be a track that has been bounced to audio • You can see the sound wave • You cannot edit individual notes	 • Part of the DAW's VST (Virtual Studio Technology) **plugins** • Software instruments are usually either synthesisers or samplers • Software instruments read MIDI data, which is either inputted by a MIDI controller or by using the pencil tool • You can edit each note individually, quantise them to be perfectly in time and change the velocity of notes
Editing tools: • Cut, copy, paste & loop • **Time-stretch** • **Speed up / slow down** • **Reverse** • **Autotune**	Editing tools: • Cut, copy, paste & loop • **Change length & pitch of notes** • **Quantise** (align the notes to a grid to make them in time) • **Velocity** (how loud individual notes are)

Synthesisers VS Samplers

Synthesisers and samplers work in a different way to create sound. Modern synthesisers now often also include sampling possibilities, such as Logic's Alchemy and Ultrabeat. The ones that you use in Logic are **plugins**.

Synthesiser	Sampler
Examples in Logic: ES1, ES2, ESP, Alchemy, Ultrabeat • Creates a sound electronically • Oscillators create a shaped waveform, such as sawtooth, sine or square wave • They often include filters to control EQ • They usually include ADSR control (attack, decay, sustain, release)	Examples in Logic: EXS24, Alchemy, Ultrabeat • They store and play back pre-recorded sound samples • They can pitch shift the samples up or down

Effects (FX)

Effects can be applied to all tracks, both audio and MIDI. They are types of **plugins**. They usually include a **Wet/Dry mix** function, which allows you to control how much of the effect you want on your track.

Reverb

Reverb recreates a **large space** such as a room, chamber or hall. They allow your sound to carry on for longer. It is used on most instruments when mixing.

Delay

Delay creates **distinct repeats** of the sound. It is also called echo. It is often used on vocals, synths and guitars.

Compression

Compression **makes the sound more even** by making the loud sounds quieter. The volume of the compressor can then be brought up with Make-Up gain, making the overall track louder.

A compressor is a **dynamic processor.**

Noise gate

A noise gate **removes quiet sounds** in between louder sounds. They are particularly useful on vocal parts (to get rid of any background noise) or on guitar parts to get rid of line noise.

A gate is a **dynamic processor.**

Phaser

A phaser copies the sound and **makes it slightly out of phase**, which creates an interesting 'swooshy' or 'underwater' type of effect.

Chorus

A chorus is very similar to a phaser, although it puts the copied sound **slightly out of time & tune** with the original, making it sound like there are multiple of the same track.

Distortion

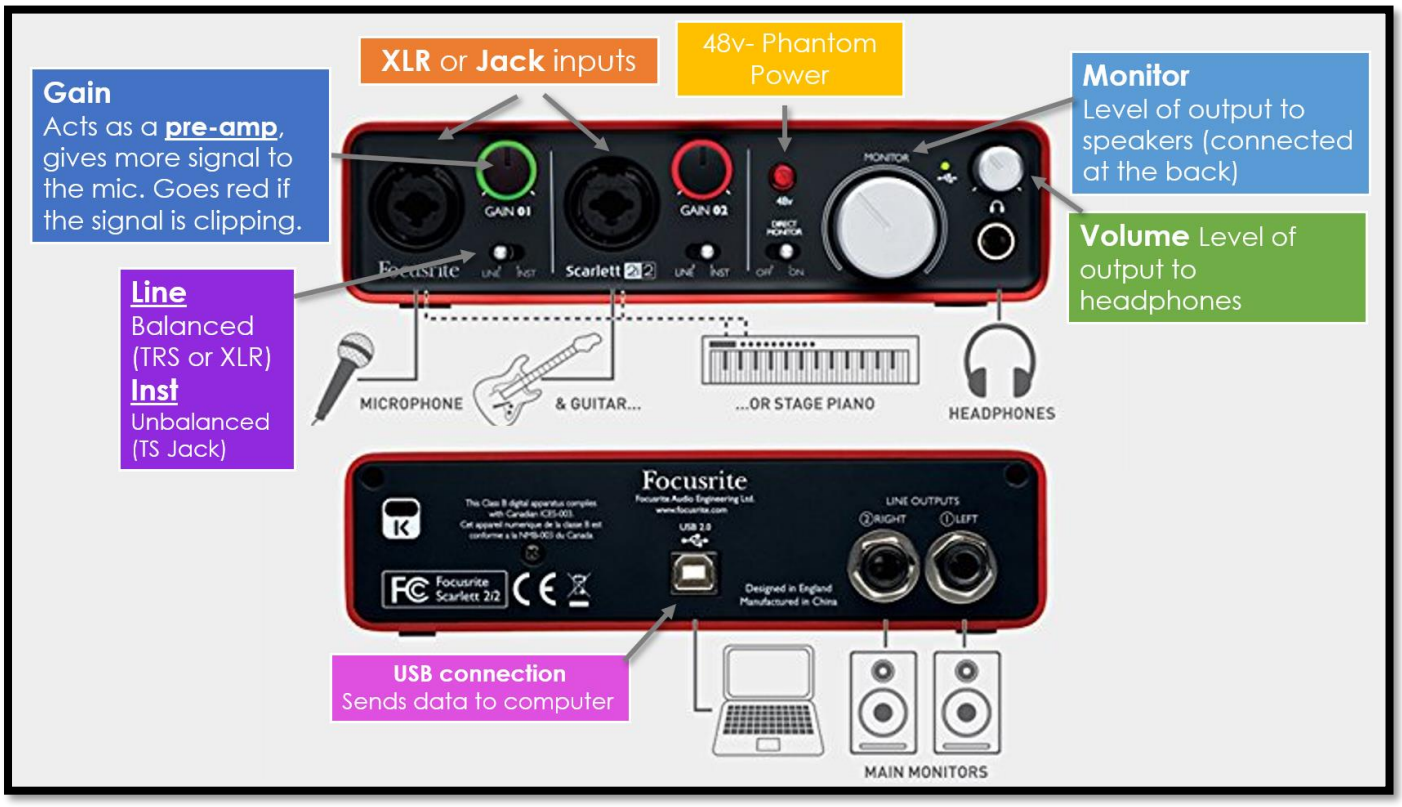
Distortion drives the gain (or volume) of the track up until it gets gritty. Distortion can also happen if you have recorded a track too loud.

Hardware

Hardware refers to all the physical objects that we use in music tech. These are all an important part of what we do, and you need to be aware of what each element allows you to do. For example, your mouse allows you to click, drag, copy and input notes. Your keyboard is very important to allow you to use shortcuts, such as pressing the space bar to play.

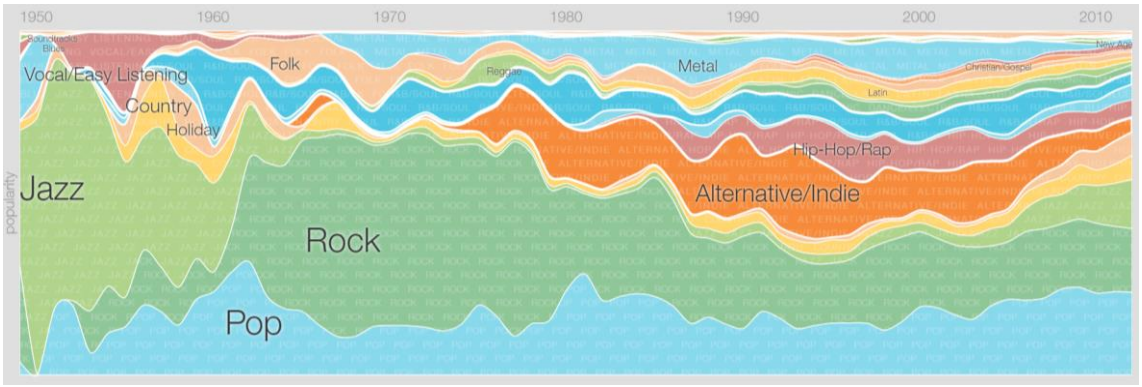
Audio Interface

Throughout your coursework, you will need to use Audio Interfaces. These enable you to transform your audio recording to digital data in your DAW. They are A/D devices, which means that they transform analogue into digital.



Styles of music

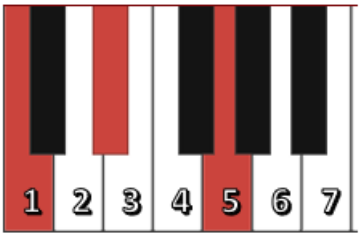
Timeline



Style	Key features	Instruments	Example artists
Jazz	• Started in the **1930s** • Uses real instruments • Came before the other styles, so has had a lot of influence • Often has instrumental solos • Associated with: Blues, Swing, Cool Jazz	Saxophone Trumpet Piano Double bass Drums Vocals	Miles Davis Duke Ellington Ella Fitzgerald
Rock and roll	• Started in the **1950s** • Often confused with rock • Similar to Blues & swing music, fast paced with the electric guitar as the main instrument • Uses slap back delay on vocals	Electric guitar Piano Double bass Drums Vocals	Elvis Presley Little Richard Chuck Berry
Reggae	• Started in the **1960s** • Often quite slow and laid back • Accent on beats 2 and 4 (chops on piano & guitar) • Often has an organ shuffle (melody) • Associated with: Ska, Dub Reggae	Vocals Drums Electric bass Electric guitar Organ Piano	Bob Marley Burning Spear UB40
Heavy rock / Punk rock	• Started in the **1970s** • Distorted electric guitar and drums are very important • Vocals are often shouted Lots of subgenres: metal, alternative, indie	Electric guitar Electric bass Drums Vocals	Black Sabbath Joy Division Green Day
Hip Hop	• Started in the **1980s** • Started with DJs playing vinyl records on turntables, looping the break beat • Rappers usually chant lyrics rapidly over the beat • Uses a lot of loops, quite repetitive • Associated with: R&B, Trap, Grime •	Vocals (rapping) Synthesisers Samplers Drum machines	Grandmaster Flash LL Cool J Kanye West
EDM (Electronic Dance Music)	• Started in the **1980s** • Based on loops from synths, samplers and drum machines • Fast pace usually intended for dancing • Associated with: Trance, House, Dubstep	Synthesisers Samplers Vocals or vocal samples Drum machines	Daft Punk Skrillex Avicii

Chords & Melody

Chords are the basic building blocks of music. They make the harmony of a song, and typical pop songs use a progression of **4 chords** which repeats itself.

Type of chord	How it's built	Example
Major	• Uses notes **1, 3** and **5** of a scale • Sounds happy / glorious	 **C major**
Minor	• Uses notes **1, b3** and **5** of a scale • This means that the 3rd note is lowered by a semitone • Sounds sad / nostalgic / dramatic	 **C minor / Cm**
7th	• Uses notes **1, 3, 5** and **b7** of a scale • They are often used in jazz • They sound jazzy!	 **C7**

The melody is the main tune in a song. It is often sung, although it can also be played on instruments. It can have different characteristics.

Pitch	The pitch can either be **high** (often female voices) or **low** (male voices).
Interval	The intervals are the distance and relationship between two pitches. So, for example if the voice jumps from low to high, you would say there are **big** intervals. If it stays close together and moves in small steps, then the intervals are **small**. Intervals are counted in steps, 1st, 2nd, 3rd, 4th, etc. which follow the notes on the piano.
Range	The distance between the lowest and highest tones of a melody, an instrument, or a voice. You can describe the range as **narrow** or **wide**.
Shape	The direction a melody takes as it turns **up, down**, or remains **static**.
Countermelody	An accompanying melody playing against the principal melody.

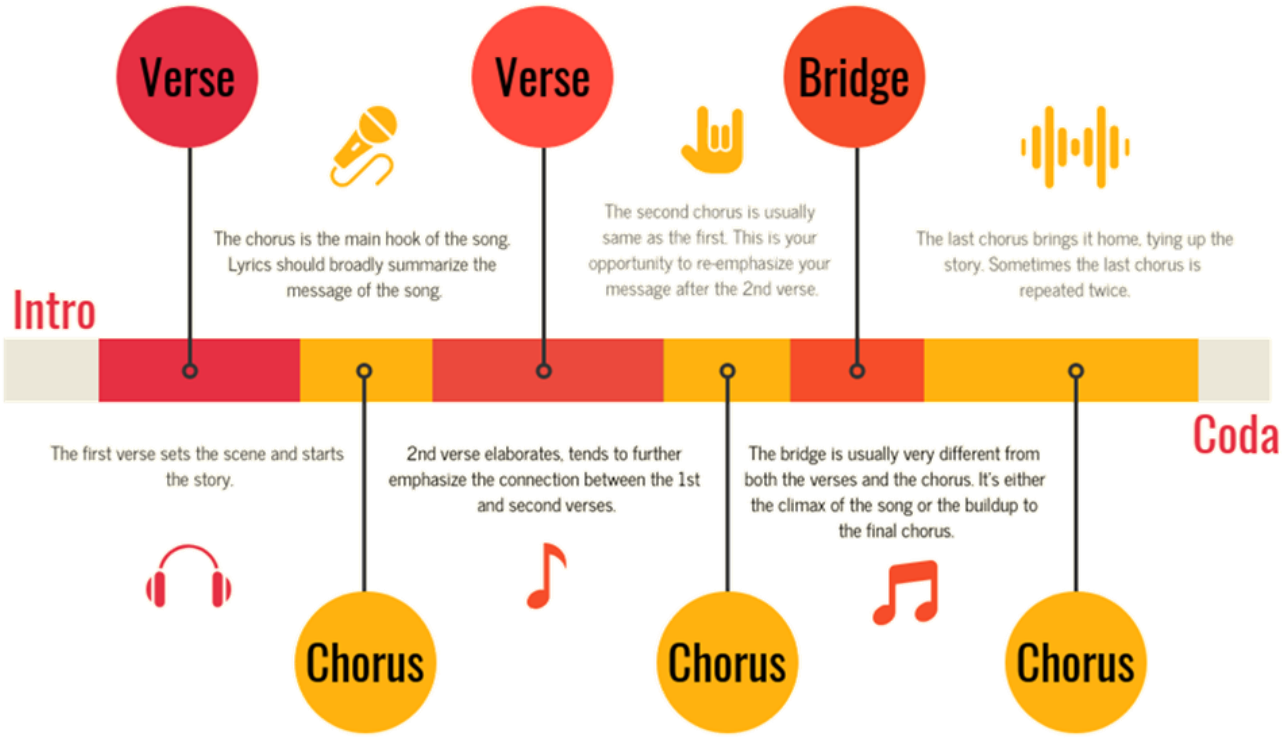
Song Structure

Song structures are often labelled with letters (A, B, C) as follows:

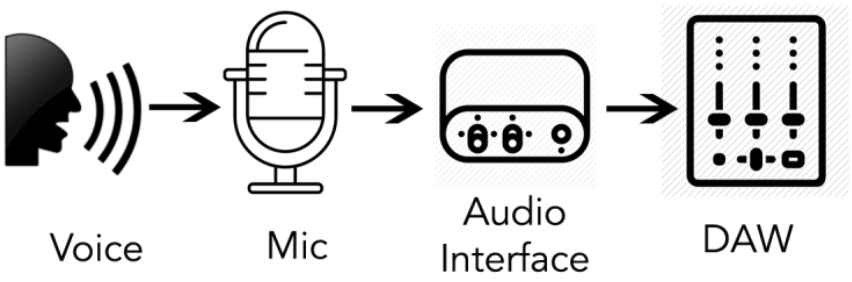
VERSE	CHORUS	VERSE	CHORUS	BRIDGE	CHORUS
A	B	A	B	C	B

Different structures have different names.

Most pop songs have a verse-chorus structure, which might also include an intro, bridge and outro (coda).



Recording



Types of microphones

	Dynamic Microphones	Condenser Microphones
Construction	Simpler	More complex
Cost	Less expensive	More expensive
Handling	Tolerates very rough handling	Requires more careful handling
Sound Quality	Excellent over a wide frequency range	Very sensitive, smooth, natural sound even at the highest frequencies
Power Source	Does not require a separate power source	Requires phantom power or batteries
Environment	Good for live performance and some recording applications	Good for controlled environments, recording and some live applications

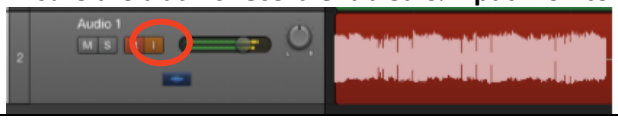
Polar Patterns

Omnidirectional
Records sound from all directions. Good for big groups & room ambience.

Cardioid
Records only directly in front. The **most useful** for single instruments & voices.

Figure of 8
Records on front & back, rejecting sides. Good for duets.

Troubleshooting

Problem	Solution
There is no sound coming into the DAW from your microphone.	• Turn the **gain** up on the audio interface • Check that there is **phantom power** for a condenser mic
You can't hear the instrument while recording.	• Ensure the track is **record enabled** & **input monitoring** is on. 
The sound isn't coming out of your headphones or speakers.	• Check that **audio preferences** have been set to the correct **output**.

Recording techniques

Close mic'ing

- Placing the microphone close to the sound source
    - **Vocals**, saxophone, flute: 6 inches
    - Amp, snare drum: 1 inch
    - Acoustic guitar: 12 inches

Accessories for mic'ing vocals

- Headphones (to hear back the track & reduce spill)
- Pop filter (to reduce sibilance (sss))
- Cradle (to reduce vibrations)

Spaced pair

- Using **two mics** to get a stereo image
- Best for recording **piano** & **drums overheads**
- Place the mics at equal distance from the sound and 3 times as far from each other

Mic'ing the drum kit

1. Kick drum– Dynamic
2. Snare & toms – Dynamic
3. Overheads – Condenser

Monitoring

When recording music, monitoring is crucial for many reasons.

- The musician needs to hear the click track while recording
- The sound engineer needs to hear whether the recording was good enough
- The sound engineer needs to compare the track to others to make sure it's professional enough

You can monitor sound on headphones or studio monitors (speakers). You should use a combination of both.

Headphones	Studio monitors
	
• Most useful for monitoring while recording • **Closed-back** headphones minimise **spill** • Headphones often have features such as bass boost, which you need to take into consideration while mixing	• Studio monitors should be matched (paired) and spaced apart so that you can hear panning • They are often better at recreating the real mix • You should compare your mix to other professional tracks on monitors regularly

Types of audio tracks

When you bounce down a project, you will get asked which format you want to bounce to. This will allow you to turn your Logic file into an audio file. There are two main types of stereo tracks.

MP3	WAV
• Small and compressed format • Lower quality • Easier to share, quick to download • You can fit more on a phone	• Higher quality, uncompressed • This is the type of file that you would use for a CD • They sound better, although most people can't tell the difference • Usually 10 times bigger files than MP3 • Usually too big to be attached to an email

Health & Safety

Category	Problem	Solution
Trip Hazards	XLR cables, Jack leads, power cables and headphone cables might be trailing across the floor in the studio.	When setting up, ensure that cables are as short as possible and not trailing around all over the floor, to do this, you can coil any excess cable and **wrap them around the microphone stand**. Ensure that you are alert of where you are stepping at all times.
Hearing Damage	Recording instruments in a small environment can result in high air pressure levels and therefore hearing damage.	If you find yourself in the music studio often, then consider purchasing **ear plugs** or noise cancelling headphones in order to protect your ears. Also, **keep the gain down** to reasonable levels.
Fire Hazard	Due to the substantial amount of electronic equipment, overheating, therefore resulting in an electrical fire is a constant risk.	**Avoid overloading plug sockets** or getting **liquids** near them. Any small fires can be tackled with **fire extinguishers**. If undiscovered, there should also be smoke detectors and a sprinkler system.
Computers	Computers can also damage your back and damage your vision when using them for a long period of time.	This can be resolved by keeping and maintaining the **correct posture** when sitting at a computer. Taking **breaks** regularly can lessen the strain on your eyes and your back.

What is a risk assessment?

A risk assessment is done by any venue in order to ensure that they are aware of all the possible risks. They need to put controls in place in order to avoid legal issues.

RISK ASSESSMENT

		CONSEQUENCE:	*LIKELIHOOD:*	*RISK:*
Event:	**MADE IN THE MOMENT**	1 = First Aid needed at scene	1 = Very unlikely	1-4 = Acceptable, no further action needed
Date of Event:	**10th June 2014**	2 = Hospital treatment needed	2 = Unlikely	5-9 = Adequate, look to improve at next review
Location of Event:	**BM&AG Round Room**	3 = Major injury as defined under RIDDOR	3 = Possible	10-16 = Tolerable, look to reduce risk
Date of Assessment:	**5th June 2014**	4 = Permanent disability	4 = Likely	17-25 = Unacceptable, stop activity and make
Name of Assessor:	**S Redgrave / K Hatfield**	5 = Fatality	5 = Very likely	immediate improvements

IDENTIFY HAZARD	PERSONS AT RISK	Consequence	Likelihood	RISK RATING	CONTROLS REQUIRED
Trip / stumble hazards	Public	1	2	2	Site inspection: no trailing wires or cables
Shock hazard from wires, plugs	BOA team	1	1	1	No mains equipment to be used on site.
Public order incidents	Artist, BOA team	1	1	1	Liaison with security staff and stewards before event and during day. Signage.
Blocking escape routes	Public	2	1	2	Ensure events kept away from public footfall and properly signposted.
Tiredness, hunger, dehydration	Artist, BOA team	1	2	2	Ensure regular breaks and supply of water
Uncertainty about fire routes, emergency route	Artist, BOA team	1	2	2	Site meeting at start of day to brief on evacuation.
Theft of equipment	Artists, crew	-	3	-	Cameras, etc, to be monitored at all times, bags, coats etc. to be securely stowed away from front of house

Sound Creation

Different forms of media

- Video game trailer
- Movie clip
- TV advert
- Radio clip/podcast
- Theatre scene

Types of Sound Creation

Foley	Foley is the reproduction of **everyday sound** effects that are added to film, video, and other media in post-production. These reproduced sounds can be anything from the swishing of clothing and footsteps to squeaky doors and breaking glass. *This is usually done by using physical props, moving them and recording the sound.*
Ambience	Ambient sound means the **background sounds** which are present in a scene or location. Common ambient sounds include wind, water, birds, crowds, office noises, traffic, etc. *This is normally done by recording environment sounds.*
Voice-overs	Voice-overs are when you can hear people talking in adverts, animated films or trailers for examples. *This is typically recorded in a studio.*
Underscore	In film production, underscoring is the playing of music quietly under a scene. It is usually done to establish a mood or theme. It is usually quite simple, so that it doesn't drown out the dialogue.
Special sound effects	These are sounds which are harder to create than Foley sounds. For example, loud explosions, space ships, futuristic technology. They typically can't be recordings of real sounds, so *they have to be created using more advanced techniques, such as sound synthesis, digital sample manipulation or going through effects libraries.*

Methods of Sound Creation

Physical Props	This method of sound creation is when you move objects around and record this sound using a microphone. For example, you might recreate the sound of a fist punch by recording a boxing glove hitting a phone book!
Environmental sounds	To record environmental sounds, you need to go to the source of the sound and record it there – for example, a river, birds singing, traffic. This can be difficult to do and you need your equipment to be portable enough to do so.
Sound synthesis	To create sounds using synthesis, you need access to a synthesiser – for example Logic's ES2 or Alchemy. You select specific sound waves which best reflect the sound that you are trying to create – for example, sine waves work really well to create beeping sounds, whilst sawtooth waves can create a really atmospheric sci-fi background.
Sample manipulation	Another great way to create sound for media is through sample manipulation. For example, if you wanted to create a robotic voice, you could record a real sound sample of someone talking, and then pass it through a vocoder, cut it into bits to glitch it, add distortion or a phaser to it, etc.
Effects library	Software is often equipped with a sound library, for example Logic includes thousands of sound effects which are free to use with the software. There are also commercial libraries, which allow you to buy sound effects and loops.

Listening Questions

In the exam, there will be some listening questions, which will require you to identify certain elements within the track. Here are some examples:

- Which two of the following instruments can you hear in the example?
- What effect can be heard on the electric guitar?
- Explain one way in which the texture of the example changes from the second verse.
- Describe the rhythm of the snare drum heard throughout the example.
- Sidechain compression has been used on the synth pad part. Describe the effect of the Sidechain compression on the synth pad in the introduction.
- Describe the chord structure heard between 0:16 and 0:55.

Be careful with trick questions!

Example trick question!

Identify two software instruments that you can hear in this track.

- 808 drum kit
- Live drum kit
- Synth bass
- Upright bass
- Flute
- Electric bass
- Live singer
- Distorted guitar
- Synth flute

A live drum kit, flute and live singer are real, live instruments. They are not software instruments! Therefore, even you can hear them, they are not the right answer!

Exam Advice

- The exam lasts for 2 hours, **use all of it**. The beginning of each section has a recommended amount of time to spend on it. If you finish before the end, go back over each question, check and add some detail.
- Read the tasks carefully and make sure that you understand what you need to complete.
- Try not to leave any blanks, you have nothing to lose if you try something!
- The marks for each question are indicated at the end of each question e.g. (1). Make as many points as it asks you to.

Exam terminology

Identify: Short answer
Describe: Answer and add a description
Explain: Answer and give an explanation of how it works or why it was done
Analyse: Long answer, you need to explore two contrasting options – pros & cons, alternatives and come to a conclusion

How should I prepare?

- ❑ Study through this guide by reading it regularly
- ❑ Make flash cards & revision notes
- ❑ Watch Youtube tutorials on how to use your DAW
- ❑ Experiment with your DAW
- ❑ Listen to music and try to identify instruments & effects