MYP by Concept 4&5

IN COOPERATION WITH ib

Music

Samuel Wright
Series editor: Paul Morris

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DYNAMIC LEARNING

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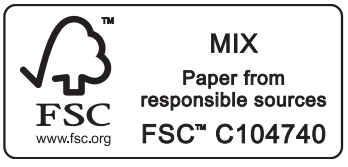

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How to use this book

Welcome to Hodder Education's *MYP by Concept* Series! Each chapter is designed to lead you through an *inquiry* into the concepts of Music, and how they interact in real-life global contexts.

Each chapter is framed with a *Key concept*, *Related concept* and set in a *Global context*.

The *Statement of Inquiry* provides the framework for this inquiry, and the Inquiry questions then lead us through the exploration as they are developed through each chapter.

KEY WORDS

Key words are included to give you access to vocabulary for the topic. **Glossary terms** are highlighted and, where applicable, **visible thinking routines** are given to encourage their use.

[Emilie: This para needs to be replaced with an example and explanation of a Take Action box.]

ctivities suggest ways to learn through

ATL

Activities are designed to develop your Approaches to Learning (ATL) skills.

Assessment opportunities in this chapter:

Some activities are *formative* as they allow you to practise certain parts of the MYP Music Assessment Objectives. Other activities can be used by you or your teachers to assess your achievement *summatively* against all parts of an assessment objective.

Hint

In some of the activities, we provide hints to help you work on the assignment. This also introduces you to the new Hint feature in the on-screen assessment.

Listening strategically: Get an IDEA

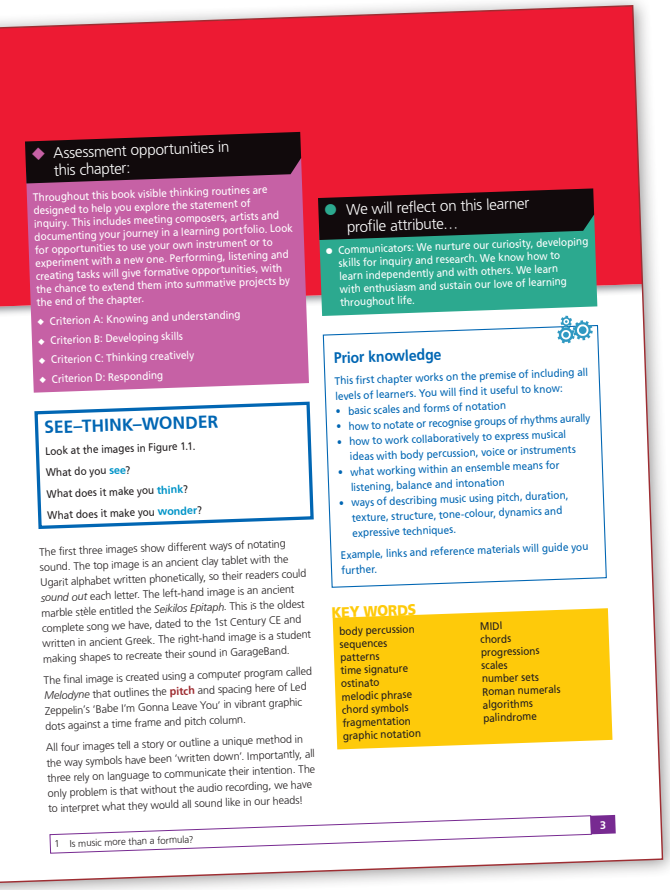
When you listen to music, try to think of the acronym **IDEA** (**identify**, **describe**, **explain** and **analyse**) to help you respond with knowledge, and correct terminology. These boxes will prompt you to do just that.

EXTENSION

Extension activities allow you to explore a topic further.

You are prompted to consider your conceptual understanding in a variety of activities throughout each chapter.

We have incorporated Visible Thinking – ideas, framework, protocol and thinking routines – from Project Zero at the Harvard Graduate School of Education into many of our activities.



Assessment opportunities in this chapter:

Throughout this book visible thinking routines are designed to help you explore the statement of inquiry. This includes meeting composers, artists and documenting your journey in a learning portfolio. Look for opportunities to use your own instrument or to experiment with a new one. Performing, listening and creating tasks will give formative opportunities, with the chance to extend them into summative projects by the end of the chapter.

- Criterion A: Knowing and understanding
- Criterion B: Developing skills
- Criterion C: Thinking creatively
- Criterion D: Responding

SEE–THINK–WONDER

Look at the images in Figure 1.1.

What do you see?

What does it make you think?

What does it make you wonder?

The first three images show different ways of notating sound. The top image is an ancient clay tablet with the Ugarit alphabet written phonetically, so their readers could *sound out* each letter. The left-hand image is an ancient marble stèle entitled the *Seikilos Epitaph*. This is the oldest complete song we have, dated to the 1st Century CE and written in ancient Greek. The right-hand image is a student making shapes to recreate their sound in GarageBand.

The final image is created using a computer program called *Melodyne* that outlines the pitch and spacing here of Led Zeppelin's 'Babe I'm Gonna Leave You' in vibrant graphic dots against a time frame and pitch column.

All four images tell a story or outline a unique method in the way symbols have been 'written down'. Importantly, all three rely on language to communicate their intention. The only problem is that without the audio recording, we have to interpret what they would all sound like in our heads!

We will reflect on this learner profile attribute…

- Communicators: We nurture our curiosity, developing skills for inquiry and research. We know how to learn independently and with others. We learn with enthusiasm and sustain our love of learning throughout life.

Prior knowledge

This first chapter works on the premise of including all levels of learners. You will find it useful to know:

- basic scales and forms of notation
- how to notate or recognise groups of rhythms aurally
- how to work collaboratively to express musical ideas with body percussion, voice or instruments
- what working within an ensemble means for listening, balance and intonation
- ways of describing music using pitch, duration, texture, structure, tone-colour, dynamics and expressive techniques.

Example, links and reference materials will guide you further.

KEY WORDS

body percussion, sequences, patterns, time signature, ostinato, melodic phrase, chord symbols, fragmentation, graphic notation, MIDI, chords, progressions, scales, number sets, Roman numerals, algorithms, palindrome

1 Is music more than a formula? 3

A playlist has been compiled of all the pieces of music referenced throughout the book. Whenever the playlist is mentioned, you can access it here:

- **https://bit.ly/HodderMYPMusiciTunes**
- **https://bit.ly/HodderMYPMusicSpotify**
- **https://bit.ly/HodderMYPMusicYouTube**

Links to:

Like any other subject, Music is just one part of our bigger picture of the world. Links to other subjects are discussed.

We will reflect on this learner profile attribute…

- Each chapter has an IB learner profile attribute as its theme, and you are encouraged to reflect on these too.

Portfolio presentation

You are expected to document your learning in a Portfolio. Activities are designed especially for your portfolio are provided throughout.

MEET THE COMPOSER / MUSICIAN / ARTIST

These boxes will introduce you to significant people in the field of music, providing background and short biographies.

Music exploration

Terminology useful to your studies is explained.

Missions and Cases

Some chapters focus on computer games, court cases or research missions for you to complete. The focus is on improving research and documenting your responses.

Finally, at the end of the chapter you are asked to reflect back on what you have learnt with our Reflection table, maybe to think of new questions brought to light by your learning.

Use this table to reflect on your own learning in this chapter.

Questions we asked	Answers we found	Any further questions now?
Factual		
Conceptual		
Debatable		

Approaches to learning you used in this chapter	Description – what new skills did you learn?	How well did you master the skills?			
		Novice	Learner	Practitioner	Expert

Learner profile attribute	Reflect on the importance of the attribute for your learning in this chapter.

1 Is music more than a formula?

Structuring sound means we can **communicate** ideas and **innovate**.

CONSIDER THESE QUESTIONS:

Factual: What are some of the ways sound is used to communicate? What is the difference between traditional and graphic notation? What is the Golden Ratio? What is a sequence?

Conceptual: How does music represent a form of communication? What are some of the ways mathematics has influenced music? How are musical sounds connected to symbols? How does a repetitive structure relate to music, mathematics and coding? How can we use patterns and sequences to create music?

Debatable: Do music and mathematics share the same rules as code? Is music a language? To what extent does music use space / emptiness to communicate?

Now **share and compare** your thoughts and ideas with your partner, or with the whole class.

■ **Figure 1.1** Different ways of notating sound

IN THIS CHAPTER, WE WILL…

- **Find out** how to recognise and then recreate patterns of music modelled on ancient and modern examples.
- **Explore** the interconnectedness of cultures with the natural world and how music forms a basis for innovation and creative thinking.
- **Take action** to research and then develop an understanding of the world we live in through connecting symbolic language with sound.

These Approaches to Learning (ATL) skills will be useful…

- Communication skills
- Collaboration skills
- Creative thinking skills
- Media literacy skills
- Transfer skills

Assessment opportunities in this chapter:

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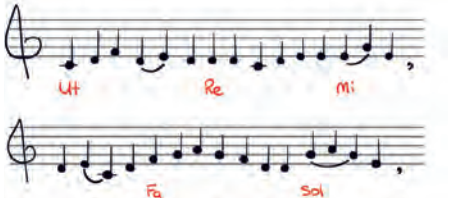
KEY WORDS

body percussion
sequences
patterns
time signature
ostinato
melodic phrase
chord symbols
fragmentation
graphic notation
MIDI
chords
progressions
scales
number sets
Roman numerals
algorithms
palindrome

What are some of the ways sound is used to communicate?

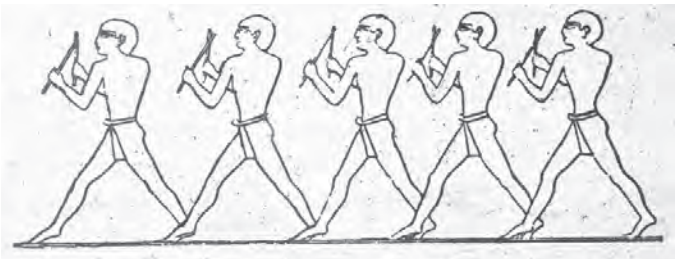
HOW HAS MUSIC BEEN COMMUNICATED THROUGHOUT HISTORY?

Notation, or writing down ideas for the purpose of communicating, is not a new concept, but the methods of notation demonstrate something of humankind's musical innovations through time. We have used everything from words, symbols and numbers, to shapes, colours and little dots to show. Why? It could be to record ideas, pass on stories or inform other musicians what to play and how they should play it.



■ **Figure 1.3** Guido of Arezzo's *Ut Re Mi* chant

One of the oldest musical instruments known to us is from Ancient Egypt, the *one-handed clapper*. Figure 1.2a shows that the playing of these instruments by female dancers was to keep those who were treading grapes in time with each other. Then if we jump forward to the 9th Century CE, we have modern *plainchant* (sung **chants**) written in the form of small dots and dashes called *neumes*. These graphical symbols are placed on four lines, and each neume carries one syllable of text tone sung. In both cases, the symbols are instructions to show and demonstrate the nature of the music being recorded (see Figure 1.2).



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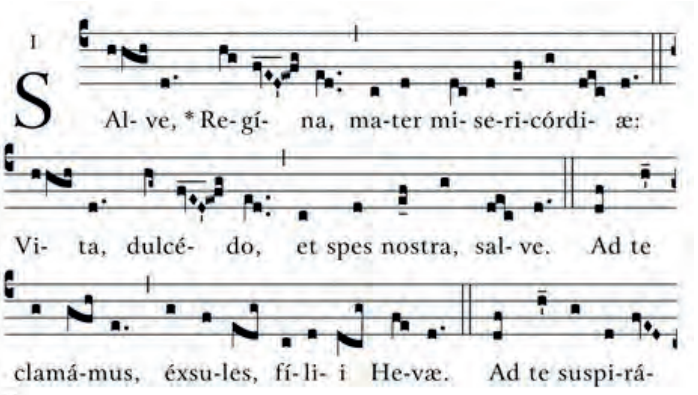


b

■ **Figure 1.2 a** Harvesters with concussion sticks. One of the oldest musical instruments known to us is from Ancient Egypt, **b** 9th Century CE modern plainchant (sung chant) *Salve Regina*

Over a century later, Guido of Arezzo (c. 1025) brings to light the chant *Ut queant laxis* with the syllables *ut re mi fa sol la*. Notice that each phrase begins with the next syllable as its following 'step'.

DISCUSS

Think about these two questions and then turn to a partner to **discuss** your answers:

1. **What could be some problems with the forms of 'musical notation' discussed above?**
2. **How do you think the Egyptians could have notated (written down) their clapping patterns?**

ACTIVITY: Twitter bot

ATL

- Creative thinking skills: Generating novel ideas and considering new perspectives

There is a bot on Twitter that regularly sends out examples of graphic notation for musicians to **create** or *perform* from. Visit **https://twitter.com/graphicscorebot**, choose one and work on performing it with body percussion and **vocussion**.

Your aim is to interpret the image within a fixed timeframe. Connect colours to certain sounds, and if there are lines and shapes you get to decide how long, soft, loud or high those sounds are interpreted. If you cannot access Twitter, **use** Figure 1.5.

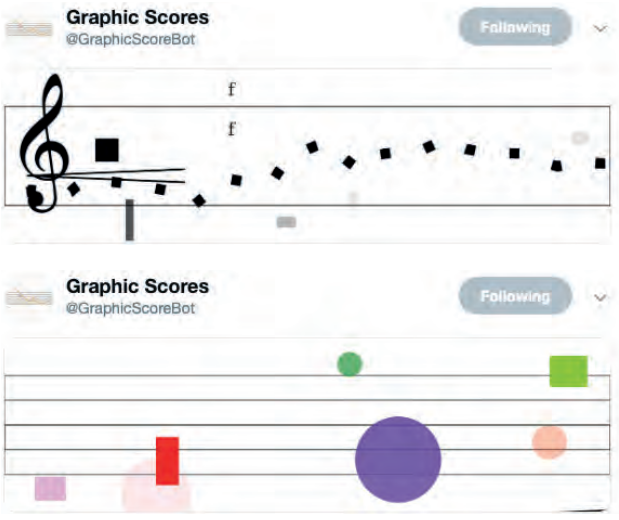


Figure 1.5 Graphic scoring examples from Twitter

Assessment opportunities

In this activity you have practised skills that are assessed using Criterion D: Responding.

Portfolio presentation

Creating a portfolio

Keeping a *portfolio* or *journal* while studying music is very important. You are expected to document your learning, the ideas you engage with and why you chose those ideas (your *process*). It is recommended that you have a manuscript book of some description and the ability to make and store videos / screenshots of your work.

BookCreator is a fantastic tool on Mac/Windows as well as iPad / Chrome. Pages on a Mac can also store both video and audio. Also check other learning systems and blogs provided by your school. These are suitable so long as they allow you to craft, curate and publish your ideas safely. Don't forget that technology is a powerful tool for making learning visible, if done in the correct way.

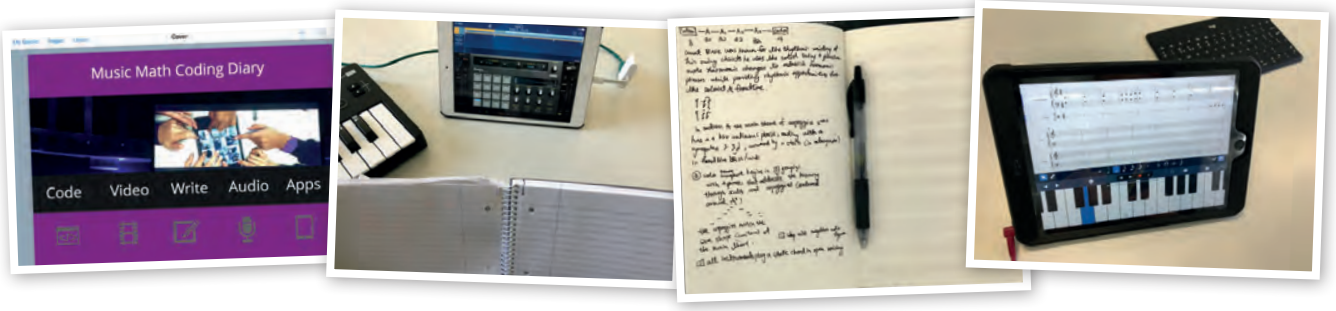
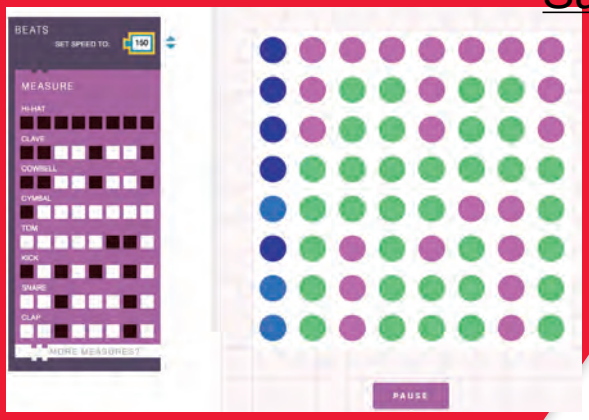
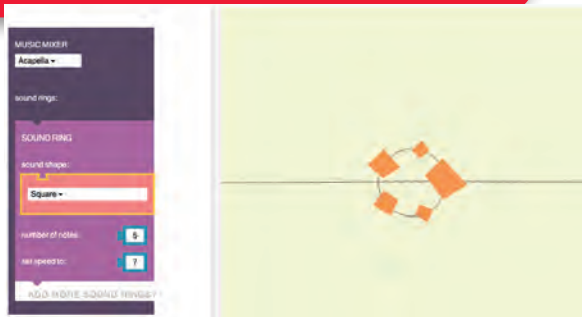


Figure 1.6 Ways to document your learning





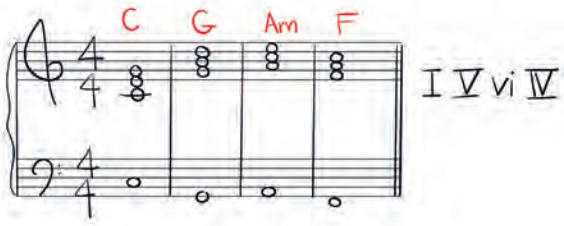
■ **Figure 1.7** Examples of block-style coding

WHAT IS A LOOP, FUNCTION OR COMMAND?

Coding can be a complicated process when you are starting out. Fortunately there are many online tutorials to help you get started. You can visit **http://code.org** for an introduction; however, we will go to 'Made With Code' to start making beats within a visual framework: **https://legacy.madewithcode.com/project/beats**

As you have seen, symbols from ancient times to the present can be used to represent sound. This is a form of coding. Here we have two programmable options for creating music. First we can program beats using a grid of boxes, or second we can program a group of pitches using rotating shapes (see Figure 1.7). Spend some time experimenting with the two options and write in your portfolio what you created. Remember, you can draw the shapes you programmed.

In coding, there are important terms to know and then use. Some of the first ones you will encounter are **commands**, **functions** and **loops**. If you are making beats, the command of 'play kick drum' could be represented by a square or by a crochet (quarter-note), whereas the grouping of commands into a string of instructions such as 'play kick and snare drum on counts 1, 2, 3, 4' is called a *function*. Loops are simply repetitions of commands and functions for a set time period.



■ **Figure 1.8** Chord progression: Snow Patrol

This means that music has its own built-in code functions that we naturally just perform. Take **chords**, for example: Chords are three or more notes, stacked on top of each other to form what is called a **triad**. They are then often arranged into a string of more chords called a **progression**.

One of the best websites to see this visually is **www.HookTheory.com** and the example song 'Run' by Snow Patrol uses the chords C major, G major, A minor and F major: **www.hooktheory.com/theorytab/view/snow-patrol/run**

In music theory, we use Roman numerals to represent chords visually. This is shown as I-V-vi-IV where C major is the 1st chord, G major the 5th, A minor the 6th and F major the 4th. This means we can write a function to say 'play the chorus of a song using the progression I-V-vi-IV'.

Did you notice the difference between both major and minor chords and the upper and lower cases of the Roman numerals? The chord A minor has a different sound quality so it has a lowercase *vi*, where all the others have upper-case symbols.

ACTIVITY: Beats, chords and code

ATL

■ Media literacy skills: Interacting with media to use and create ideas and information

Search for your favourite song(s) on HookTheory and write down the Roman numerals in your portfolio.

Assessment opportunities

In this activity you have practised skills that are assessed using Criterion A: Knowing and understanding.

! Take action

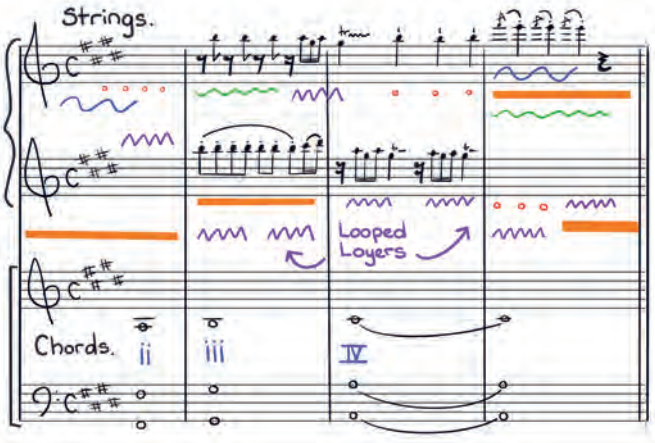
- ! Research and then develop an understanding of the world we live in through connecting symbolic language with sound.
- ! The *Hour of Code* is a global event held each year during Computer Science Education Week. Collaborate with your school, or organise a 'Music-Coding' event using Sonic Pi (**https://sonic-pi.net**) and micro:bit (**https://microbit.org**). As well as participating in the *Hour of Code*, you can finish off each session with a concert of coded music.

HOW ARE MUSICAL SOUNDS CONNECTED TO SYMBOLS?

The world of music has changed with technology. The way humans adapt their needs to their surroundings has meant we find solutions to create new sounds wherever we are.

One of the oldest surviving instruments known today is a flute carved from a crane's bone, dating to the Shang Chinese people of the 14th Century BCE. From there, humans have developed various **idiophones**, **chordophones**, **aerophones**, **membranophones** and now **electrophones**. The ethnomusicologist Curt Sachs, in his book *The History of Musical Instruments*, classifies instruments by their **tone-colour**. By grouping instruments this way, we can actually call on them, like a function, when we want to group particular sounds in music.

Listen to an excerpt of Antonio Vivaldi's 'Spring', reworked by modern composer Max Richter using chordophones and an electrophone, on the playlist. Richter has taken the melodic string parts and **fragmented** their **pitch material** into smaller looped patterns that are then layered over a low sustained chord progression.



■ **Figure 1.9** Max Richter's 'Spring 1' showing violin loops against rising chords ii-iii-IV (mm30–33)

Music has symbols, and communicates as a language with properties similar to mathematics and coding. Max Richter understands how loops can fit within a musical piece because he understands the building blocks of music. By applying knowledge of the building blocks, we can discuss examples from metal to medieval. These building blocks will be repeated throughout this book in activities and side missions: pitch, **rhythm**, texture, structure, tone-colour (timbre), dynamics and expressive techniques.

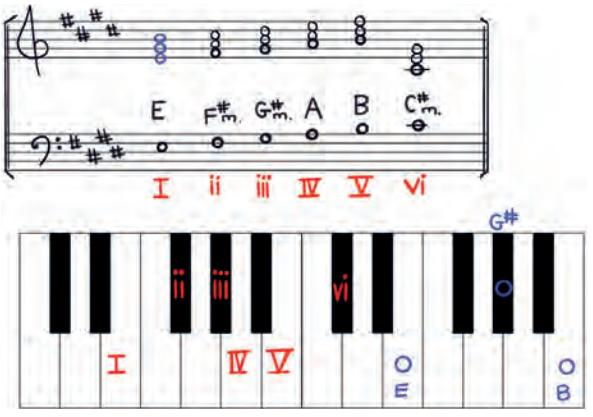
ACTIVITY: How does music communicate with code?

■ ATL

■ Media literacy skills: Comparing, contrasting and drawing connections among (multi)media resources

Using the Max Richter example above, can you see how coding language could have been used to **create** this version of Vivaldi's 'Spring'?

Using the Roman numeral chords provided, change their order and experiment with playing the chords in Figure 1.10 on an instrument. By repeating and overlapping different notes, Richter is able to achieve a continuously evolving texture. Can you do the same a small group or with your class?



■ **Figure 1.10** Chord-progression activity

◆ Assessment opportunities

In this activity you have practised skills that are assessed using Criterion A: Knowing and understanding.

EXTENSION

Visit the Deutsche Grammophon website to download the app for iOS by Touchpress with both Vivaldi's and Richter's versions of 'The Four Seasons': www.deutschegrammophon.com/en/album/ipad-app-vivaldis-vier-jahreszeiten.html. You will see traditional and graphic notation side by side as the work is performed. This is an innovative way of combining technologies.

Listening strategically: Get an IDEA

When you listen to music, try to think of the following acronym to help you respond with knowledge, and correct terminology:

Identify the sounds, or patterns you hear.

Describe how they are being played, presented, layered.

Explain what role they play in the structure of the work.

Analyse the smaller parts (**intervals**, **motifs**, **sequences**) to their outward larger parts of form, modulations, phrases and **cadences**.

Listen to the track 'Vocussion' from the album *New Impossibilities* by the Silk Road Ensemble. As you listen, can you imitate each layer of sound? Better yet, notate them as symbols? What sounds or patterns can you **identify**? **Describe**? **Explain**? **Analyse**?

An example is provided below to help you start practising for your portfolio.

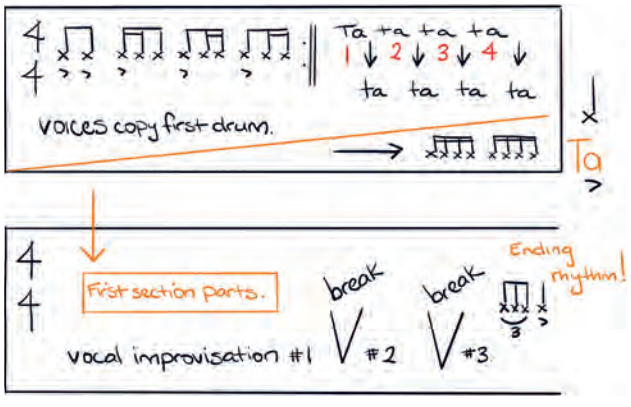


Figure 1.11 Vocussion graphic map

MEET THE COMPOSER: ERIC WHITACRE

Figure 1.12 An image from the Hubble Telescope

Deep Field is a work composed by Eric Whitacre based on the Hubble Telescope. He was inspired by the struggle and beauty that accompanied the creation of the photos taken by the telescope. Whitacre is a composer who uses the human voice and an innovative approach to technology. He even combined choral singing with dubstep in his work entitled 'Fly to Paradise'.

Using the internet and singers around the world, Whitacre composed *Deep Field* using a form of notation that included an overlapping pattern of musical sounds, much like the stars and constellations in space. A similar example based on *Deep Field* has been composed for you to try and sing or play in your classroom. What do you notice about the way the melodic parts have been written?

Visit the website of Whitacre's *Deep Field* to watch the film and then complete all the badges as you learn about Whitacre's approach to combining science and music: https://deepfieldfilm.com/badges

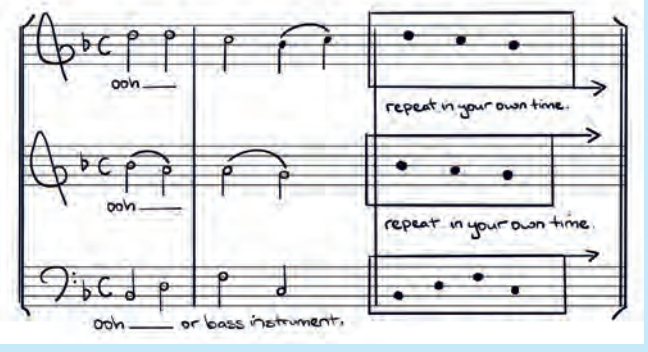


Figure 1.13 Vocal performance piece: Use the boxed notes to experiment with the length, dynamics and spacing of each part

What are some of the ways mathematics has influenced music?

SEE–THINK–WONDER

Look at the image of the spiral galaxy taken by the Hubble Telescope in 2018 in Figure 1.12. What do you **see**? What does it make you **think**? What does it make you **wonder**?

Create a heading in your portfolio and add your responses to these questions as well as your classroom performance **using** Figure 1.13.

WHAT IS THE GOLDEN RATIO?

Mathematics is an amazing language of symbols, ratios, number sets (recurring groupings of natural numbers, integers, rational and real numbers) plus operations, all interacting with each other. We spend time learning the rules and order of operations so that we can utilise and engage with this language called *mathematics*. Music can be exactly the same. In fact, musicians can give voice to many types of different symbols, express emotion through ratios, combine sets or groups of sounds and communicate these to any audience around the world.

According to the book *Incredible Numbers* by Professor Ian Stewart, '… Leonardo of Pisa (1202) wrote an arithmetic text, the *Liber Abbaci* (*Book of Calculation*) explaining Hindu–Arabic numerals 0–9 to a European audience'. This text included an example from studying the breeding habits of rabbits. He was later nicknamed Fibonacci, as was his number set of 1, 1, 2, 3, 5, 8, 13, 21, 34, and so on. Notice the pattern of adding the first two numbers to get the next in the sequence? 1+1=2, 1+2=3, and so on. This led to even further discoveries of the same occurrence in nature, from cones to shells and the Milky Way.

Artists (such as Da Vinci) have used it for painting human subjects, and architects have used it for aligning proportions (such as in ancient Greek monuments).

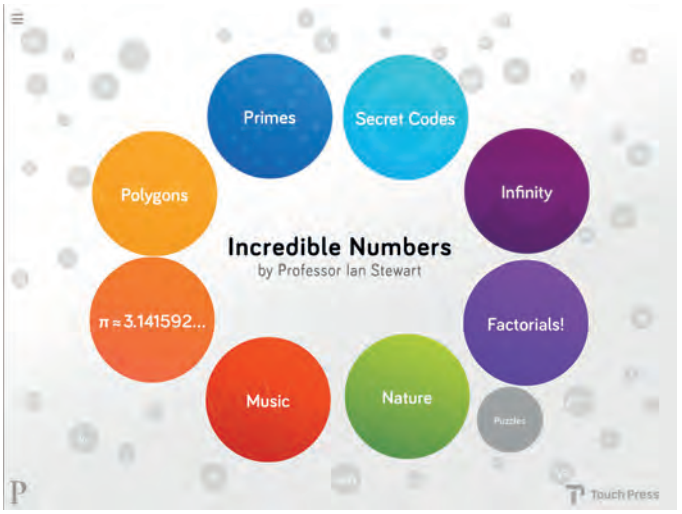


Figure 1.14 *Incredible Numbers* by Prof. Ian Stewart

Composers including Bach, Schubert, Bartok and Debussy have used it to structure their works. Bach's first book of inventions contains 15 pieces in carefully arranged musical keys. Observe how Bach set about organising the pieces with the *Golden Ratio* (≈ 1.62) and as a **palindrome**. Fifteen pieces divided by 1.62 gives us the middle work in the palindrome, of A major.

Piece and key	Meter
1 **C major**	4/4
2 d minor	3/8
3 e minor	4/4
4 F major	3/4
5 G major	9/8
6 a minor	4/4
7 b minor	4/4
8 B-flat major	4/4
9 A major = **Golden Ratio**	**12/8**
10 g minor	4/4
11 f minor	3/4
12 E major	3/8
13 E-flat major	4/4
14 D major	3/8
15 c minor	4/4

Figure 1.16 Patterns in Bach's first book of Inventions read forwards and backwards

ACTIVITY: Fibonacci as a structure

ATL

- Creative thinking skills: Generating novel ideas and considering new perspectives

Wolfgang Amadeus Mozart was known as a composer of particular lyrical genius. We are going to look at how he structured the following solo piano work around the Golden Ratio. The *structure* of a work is how it is put together, piece by piece, layer by layer. This includes all the connecting parts that help Mozart's ideas transition between rhythm, harmony and melody in the *form* called a **sonata**. Mozart cleverly approaches the overall structure by using the Golden Ratio:

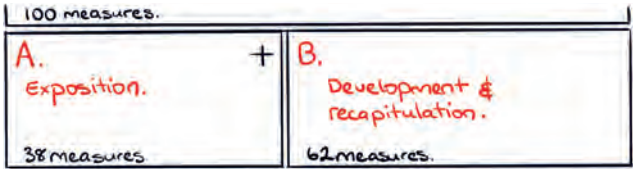


Figure 1.17 Mozart's 'Piano Sonata No. 1 in C Major K279'

The **exposition** is where the main melodic ideas are communicated. Mozart does this in 38 bars.

The **development** is where a composer expands and embellishes their ideas. Combined with the **recapitulation** that brings back the opening material, Mozart uses 62 measures to accomplish this. Within the whole of 100 measures it is structured perfectly as 38+62 or 100/1.62 (the Golden Ratio).

In your portfolio, make a list of the methods for **using** the Golden Ratio or Fibonacci sequences to structure a musical work, showing:

1. **an overarching form,**
2. **the lyrics, and**
3. **the rhythm.**

What other ways and methods might work? Brainstorm a few with your class using the pieces discussed above as inspiration. **Create** a mind-map of your findings and record on your device or laptop any musical versions that you create.

Assessment opportunities

In this activity you have practised skills that are assessed using Criterion A: Knowledge and understanding and Criterion D: Responding.

We've just seen how Mozart used the Golden Ratio to structure his sonata, but what about using the Fibonacci numbers within a different structure?

Duo, Mos Def and Talib Kweli have done exactly this with their song 'Astronomy (8th Light)' by outlining the Fibonacci progression in their rapped chorus. This provides a returning theme (or stanza) that unifies the entire work.

> *"Now everybody hop on the* **one***, the sounds of the* **two**
> *It's the* **third** *eye vision,* **five** *side dimension*
> *The* **8th** *Light, is gonna shine bright tonight"*

Now take a look at how Hungarian composer Bela Bartok used the same set of numbers for a rhythmical structure in the third **movement** of his *Music for Strings, Percussion and Celeste*. Bartok created a palindrome melody for the xylophone with a rhythmic focus on 1 1 2 3 5 8 5 3 2 1 1.

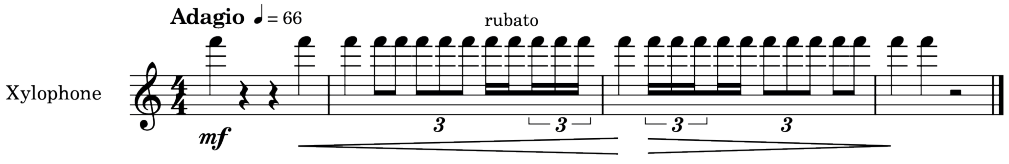


Figure 1.18 Bartok's *Music for Strings, Percussion and Celeste* '3rd movement'

EXTENSION

Ensemble puzzle

Try solving this musical puzzle: If you clap a beat in 4/4 time with 8 **quavers** (8th notes) in each bar, how could you represent a Fibonacci pattern while just clapping?

Hint

Use **accents**!

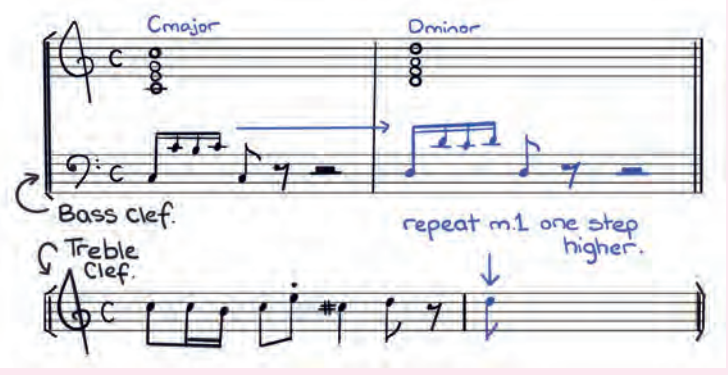
How can we use patterns and sequences to create music?

■ **Figure 1.19** Examples of Fibonacci in nature

WHAT IS A SEQUENCE?

Music exploration: Earworms and sequences

Using the opening of Mozart's 'Piano Sonata No. 1 in C Major K279', let us have a quick look at the melody and an important *musical pattern* called a *sequence*. Mozart cleverly writes melodies that repeat and get stuck in your head like an 'earworm'. One of the ways he accomplishes this is by repeating a string of notes in the exact same way, just a little higher or lower. The work below opens with 4 bars of notes that are played over a C major and then D minor chord (I-ii, I-ii). Then in measures 5 to 8 a melody is repeated in the top part but ascending a little higher each time. This is called a *sequence* and it allows you to repeat material, as long as it is based upon the very first version. See if you can make a series of sequences like Mozart's by continuing the pattern:



■ **Figure 1.20** Sequence example from Mozart. See the sequence in blue?

EXTENSION

Ensemble performance

Try warming up on your rhythms, **scales** and **arpeggios**, but only accent certain number patterns, such as 3+4, 2+1, 1+3, 8, 5, 3, 2, 1. Then **create** a sequence of notes and rhythms that will help you **explore** your instrument. You could even try Bartok's Palindrome of 1 1 2 3 5 8 5 3 2 1 1. Your warm-ups will improve out of sight.

Listening strategically: Get an IDEA

When you listen to music, try to think of the acronym **IDEA** to help you respond with knowledge, and correct terminology.

Listen to the piano sonata 'K279 No. 1' by Mozart. As you listen, can you sketch the structure of the work? Include changes in rhythm or melody as smaller observations. What sounds or patterns can you **identify**? **Describe**? **Explain**? **Analyse**?

ACTIVITY: Fibonacci body percussion

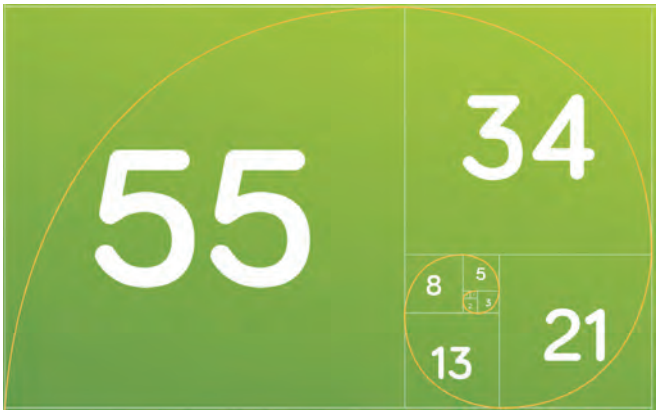
ATL

■ Collaboration skills: Working effectively with others

Having a predetermined structure in mathematics, nature and music is incredible. It can free us up to be more creative when we know the framework to work within. The spiral and combination of the Fibonacci sequence below clearly **outlines** the macro image of a larger rectangle made up of smaller, yet proportionally equal, rectangles. What if we could **use** this as our basis for making music together?

Using the Fibonacci sequence you are going to interpret the numbers shown below into a rhythmically complex work.

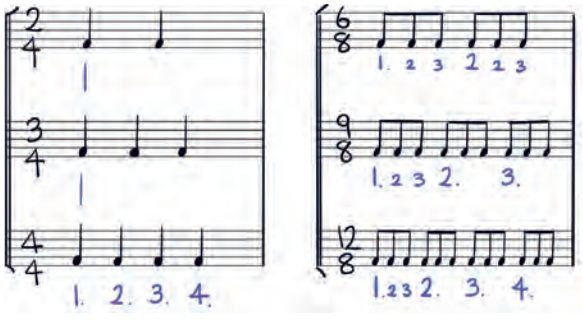
1. **Break into eight pairs or groups, and choose one rectangle from this golden spiral (Fibonacci spiral).**
2. **Create a rhythmic ostinato pattern in 4/4 time by clapping, clicking, beat-boxing, and so on. Your ostinato pattern must accentuate your chosen number(s) of the spiral, for example Group 1 can clap 1, 2, 3, 4, like a kick drum. However, those who chose 3 4 could clap 1 2 3, then 1 2 3 4. Alternatively, you could click on every 3rd and 4th beat; it is up to you how you interpret your numbers – be creative.**
3. **The task is finished when each group can a repeat their pattern and b perform their pattern against another.**
4. **What do you notice can happen when you all play together?**



■ **Figure 1.21** Fibonacci spiral from the app 'Incredible Numbers' (see page 9)

Assessment opportunities

In this activity you have practised skills that are assessed using Criterion A: Knowing and understanding and Criterion B: Developing skills.



■ **Figure 1.22** Time signatures and note values

Having used body percussion and vocussion to express the Fibonacci sequence, let us go to a different rhythmical focus: the **time signature**.

In music, the top number tells us *how many* beats there are in a bar, whereas the bottom number tells us what *type* of beat is used.

A time signature is not a fraction, for example 2/4 means two **crotchet** (quarter) notes per bar; 6/8 means six quaver (8th) notes per bar. As you can see from Figure 1.22, we can also **subdivide** these beats, as long as they add to the top number in the time signature.

If we continue this pattern of using 2s and 3s, we can get 2+3=5 (Fibonacci), and 2+3+2=7 (not Fibonacci), 2+2+2+2=8 (Fibonacci), and 3+3+3=9 (not Fibonacci). However, if we combine these three results, like the band TOOL did in their track 'Lateralus', with alternating time signatures of 9 8 7, we get the 16th number of the Fibonacci sequence (987) and a very clever use of the Fibonacci sequence to decide which time signatures to use in a piece of music.

ACTIVITY: Movement in time

ATL

- Communication skills: Interpreting and using effectively modes of non-verbal communication

Using the following pieces from the playlist, you are going to move your body in time to the correct time signatures *and* rhythm groupings. The emphasis will be on showing the rhythmic layers of each work through physical movement, for example if you play Dave Brubeck's 'Take Five', you want to move, dance or clap in time to 5/4, but accentuate the grouping of 3+2. Then, if you play '5/4' by Gorillaz, you will want to emphasise the grouping of 2+3 with the guitar part.

Track	Artist	Album
Five	CoCo's Lunch	Invisible Rhythm
5/4	Clogs	Lantern
5/4	Gorillaz	Gorillaz
Money	Pink Floyd	Dark Side of the Moon
7/4	Dave Brubeck	Unsquare Dance
I was brought to my senses	Sting	Mercury Falling

The aim is to **create** a series of body shapes and movements to the music. Remain fixed to the floor and ensure you have space around you. Listen carefully to discern the rhythmical groupings and time signatures. They will **use** combinations of 2s and 3s.

1. **Begin with lower level movements (kneeling on the floor) showing percussion sequences with the floor.**

Figure 1.23 Teachers dancing to 'CoCo's Lunch'

2. **Next, move to middle level (standing but fixed) using patsching, stamping and clapping.**
3. **Finally, move to upper level (arms above head and shoulders), showing shapes that outline the music's patterns.**

As a class, comment on the way each band / artist used rhythmic groupings and how they layered them within the works. You are engaging in the musical concepts of **duration** and **texture**.

Assessment opportunities

In this activity you have practised skills that are assessed using Criterion B: Developing skills, Criterion C: Thinking creatively and Criterion D: Responding.

THINK–PUZZLE–EXPLORE

Listen to the track 'Lateralus' by TOOL and discuss the following questions in groups:

1. **What do you think about the Fibonacci number sequence now?**
2. **What unanswered questions / puzzles do you still have?**
3. **How can you explore this topic further in music?**

Hint

You can find more Fibonacci connections to the band TOOL with a web search and by graphically notating sections of the work 'Lateralus'.