KS3/4

Graphic scores

by David Ashworth

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BACKGROUND

From the early decades of the 20th century onwards, many emerging composers found that the established system of standard notation was becoming an increasing constraint on allowing them to fully express their musical ideas.

As early as the 1930s, US composer Henry Cowell was experimenting with new notation ideas, but it was during the 1950s that really significant developments were made. Composers such as John Cage, Earle Browne and Morton Feldman experimented with musical forms that included chance procedures and opportunities for improvisation. They were looking for ways to allow creative input from performers, including interpretation of written scores. The use of an extended graphic notation enabled them to realise these aims.

During the 1960s in the UK and elsewhere, these approaches were explored and further developed by composers and musicians working in the emerging post-war jazz and experimental music scenes, including Michael Nyman, Howard Skempton, David Bedford and Gavin Bryars. Scores and recordings by these musicians make for fascinating study, but most are probably going to be too demanding for classroom use at KS3/4.

Some of our more enlightened music educators, however, such as John Paynter, R Murray Schafer and George Self, realised the potential and musical benefits of bringing these new notation forms into schools. It is well worth seeking out their publications, which can easily be adapted and modified to make them suitable for music making in contemporary classrooms.

The benefits of graphic notation

There are many advantages to exploring graphic notation in the classroom:

- It's a fact that most of our young students will only have a limited experience of working with and understanding standard musical notation. This, in turn, imposes real constraints of the music they can make and perform using stave-based notation. Introducing elements of graphic notation can provide the freedom to realise musical potential more fully.
- Graphic scores can often allow for more creative engagement and output, by providing the players more opportunities to decide what and when to play.
- As a consequence, this can make opportunities for differentiation in classrooms much easier, allowing more experienced students to be challenged, while providing stimulating but less demanding opportunities for less confident students.
- Many graphic scores are quite flexible in terms of specifying which instruments can be used. This makes them particularly suitable for different teaching contexts, especially in classrooms where we have some students playing a wide range of instruments to a high standard, and others who have little or no background in instrumental playing.
- A well-designed graphic score can provide a 'big picture' overview that students can easily understand. They can see how a piece is structured and how it develops over time.
- There are considerable opportunities for cross-curricular work. These include designing and producing graphic scores using hand-drawn or computer-based techniques; working with mathematical shapes and systems; considering cycles and patterns derived from nature – all these provide exciting opportunities for cross-disciplinary exploration.

BEGINNINGS

Activity 1

For many students, working with any sort of notated score and following a conductor are going to be new experiences. So let's begin with a straightforward exercise.

Each student in the class will require access to a pitched instrument. Where space and instruments are limited, consider strategies such as having three students to a single keyboard, having access to different registers, dividing sets of chime bars, and so on.

They will be playing sustained notes, so set keyboard sounds to strings, synths to woodwind settings, etc. Students playing acoustic instruments with limited sustain should tremolo notes. Instruct those playing loud instruments to play as softly as possible in order to achieve good balance between instruments.

The conductor gives a series of downbeats. On each downbeat the students should play any single sustained note. They can remain on the same note for each downbeat or they can move through a series of pitches during the course of the piece. The result will be a series of sustained chords. Each chord should sustain for about ten seconds, and chords should be separated by a few seconds of silence.

With large groups of students, consider having half the class perform while the rest listen and enjoy the rich succession of harmonies. They should then swap over.

This activity helps students to develop the skill of following a conductor and appreciate how sophisticated, complex sounds can be produced as a result of a simple set of instructions.

Review, refine and repeat the exercise a few times. Are all students coming in on the downbeat? Can we achieve a better balance of sounds by instructing some students to make volume adjustments?

Activity 2

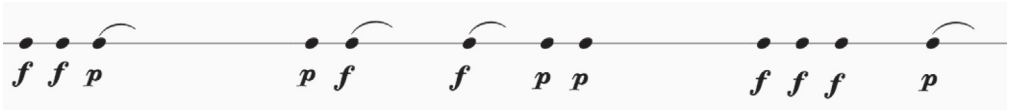
The next step is to introduce a simple graphic score.

An early graphic work was *Projection 1* for solo cello by Morton Feldman. He used rectangles of different lengths to indicate relative duration. The performer was free to choose the pitches of the notes played. We can easily create scores that follow this principle, using either:

- blocks of different widths, where the width of the block indicates relative durations:

- or simplified forms of standard notation, where a black note indicates a short sound, and black notes with slurs indicate sustained sounds. These can also be used to help develop percussion playing skills (for example, playing open and damped sounds on a triangle or cymbal):

A further development, which also helps students develop instrumental playing and reading skills, is to add dynamic markings:



These approaches can be developed into longer scores, and are suitable for solo or small group/larger ensemble work with a conductor.

FURTHER DEVELOPMENTS

Musicians and educators such as David Bedford and John Paynter were responsible for developing a significant repertoire of music using a range of ways of working with graphical ideas.

Like many young composers of his generation, Bedford supplemented his income by teaching music in schools. To address the challenges of whole-class ensemble performance, he created many resources for singers and instrumental players, using a blend of elements of standard notation with other symbols and forms.

Paynter was keen to raise the profile of contemporary music and also give young students opportunities for creative input in performance. Devising graphic scores addresses both of these aims.

This culminated in Bedford, Paynter and others – including Howard Skempton and Hugh Shrapnel – having their works collected and published in Universal Edition's *Music for Young Players* series. These works are now sadly out of print. However, some of the resources and related articles can be accessed from the British Music Collection here.

Some of the activities that follow use ideas from this series as a stimulus.

GAMES

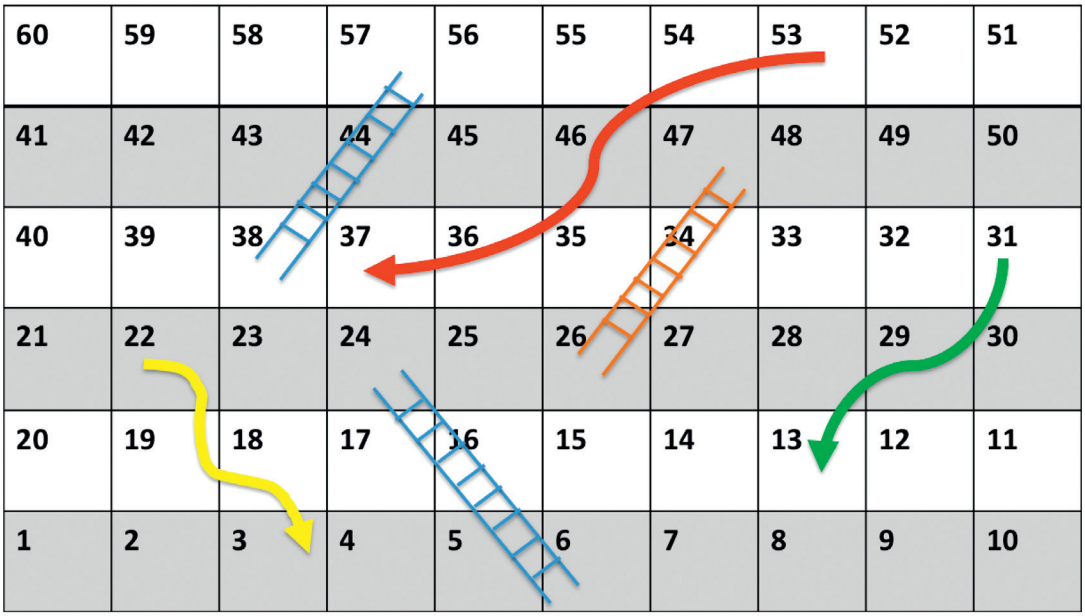
Scores based on popular board games, such as Snakes and Ladders and Ludo, provide ideal frameworks for music making. These games provide structures, rules and systems of progression (in other words, they have a definite beginning and end). Many students will be familiar with these games, and making music in a games-based context is usually enjoyable and engaging.

Activity 3: Snakes and Ladders

This activity uses the conventions of the game Snakes and Ladders to provide a framework for musical performance.

The first problem we have to address is the challenge of scaling up games designed for a few players to a much larger group. Rather than using an actual Snakes and Ladders board, which would be too small for use in a typical classroom of 25 to 30 students, we can project an image of a board onto a large screen. Either use the one provided here or download a suitable image from the internet.

The other element we have to consider is shaking the dice. It would be impractical and too distracting to use a real dice in this situation, so a simple, effective alternative is to use a random number generator. These are many examples that can be accessed on the internet (including random.org, which even has a ready-made dice roller). Simply set the minimum and maximum values to 1 and 6 respectively and click at regular intervals. Students then work with whichever number is displaying as they prepare to make their next move.



Students will already be familiar with the rules of moving around a board like this, including going up the ladders and down the snakes. All we need to do is to add some instructions as to how we use the numbers on the board to generate musical material. Here are the rules I use, but feel free to adapt:

1. Numbers 1 to 9: repeat a chosen note that number of times. So a player landing on 7 might choose to play the note G seven times.
2. Numbers ending in zero: free choice.
3. Number 60: play your highest possible note rapidly and repeatedly. When others hear this, they should join in until everyone is repeating their highest note. Then all should fade to end the piece.
4. All other numbers: the second digit indicates the number of notes to be played in a phrase, and the first digit indicates how many times to repeat that phrase. So 37 means play a seven-note phrase three times, and 25 means play a five-note phrase twice.
5. Snakes and ladders: play the number at each end. So landing on 53 means play 53 then 37 at the bottom of the snake.

NOTES

The aim is to use this activity for a musically rewarding experience. It might be best to work with smaller groups before attempting this as a whole-class exercise. Give some thought to choices of instruments. Try to use ones that will blend together well. Atonal pieces can sound interesting, but it might be more expedient to limit note choices to notes in a given scale. Having some students providing subtle drones and a steady beat, using simple hand drum rhythms, can provide a suitable musical background.

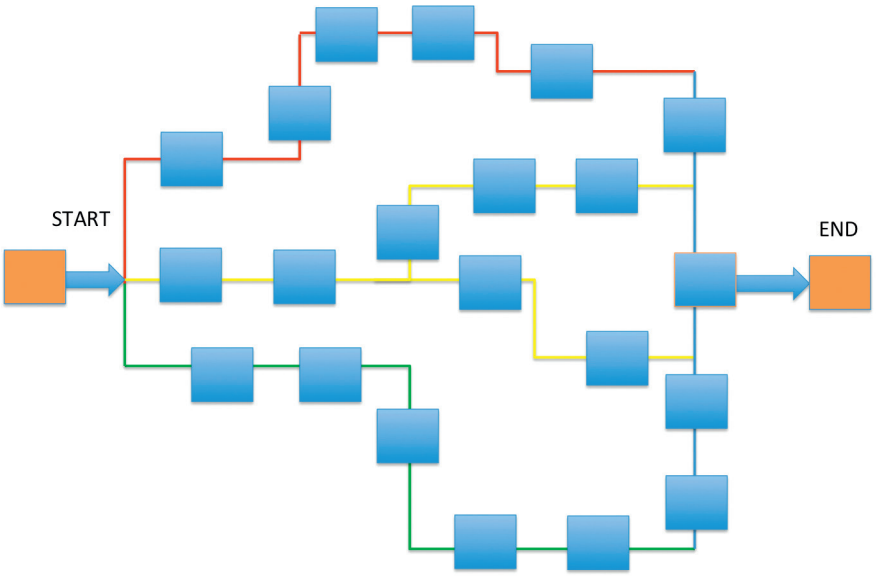
Above all, encourage students to listen carefully to what others are playing, and to try and make their contribution fit in with what they hear around them. Throughout the performance, encourage them to make all their playing musically interesting and worthwhile. They should not be merely hitting notes at random.

The conventions of this game provide a definite progression and also control aspects of development to some extent. As students reach the higher numbers, the music becomes denser, with more repetitions.

Activity 4: Ludo

A Ludo board-type layout can be adapted by placing musical instructions on each of the squares. In Ludo, players are allocated a colour and have different starting points on the board. They progress once around the board before moving up the 'home' path to the end.

Adapt this idea by devising a set of progression pathways. Players are allocated a given colour. Everyone plays the content of the first orange box and then proceed around their colour pathway. In their own time, they make their ways towards the final destination, the orange box. Note that the yellow players are given a choice of two possible pathways after they've played the first two boxes. Players move independently, but they should be aware and respond sensitively to the sounds around them. They should also be encouraged to think before they play! Players can all begin together, or be brought in one at a time. The piece ends when the final player has played the END box.



Add some musical instructions to each box. For example:

Box content	Interpretation
S × 5 (*f*)	Play a phrase comprising five short notes – loud.
L × 6 (*mf*)	Play six long notes – moderately loud.
L × 2; S × 5 (*p*)	Play two long notes followed by five short notes – softly.
[S, S, S] × 4 (*mf*)	Play a three-note phrase four times – moderately loud.
SILENT 10	Be silent for a count of ten.

Some control of form can be given to the piece. For example, make the initial boxes for all players comprise of long, quiet notes for a gentle beginning.

It is also possible to provide some differentiation. For example, the green pathway could contain more challenging material while the red one could have simpler instructions.

Agree on a given scale or set of note choices if a more 'tonal' outcome is required.

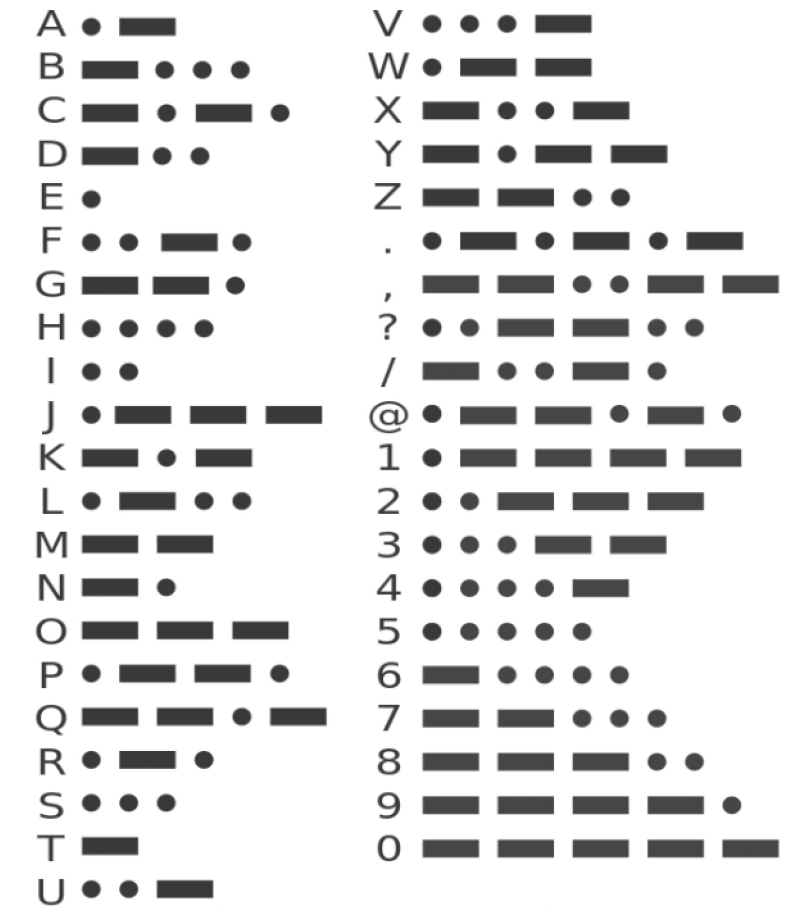
If the basic framework is drawn onto a large whiteboard, teachers or students can devise the content of the boxes themselves by writing them on sticky notes that are added to the board.

CODES

The Morse code system using dots and dashes to represent letters can provide interesting and fruitful ways of using coding to generate musical rhythms. There are many examples of the conscious use of Morse-pattern rhythms in pop songs, including Rush's 'YYZ', the Clash's 'London Calling', Abba's 'SOS' and several Kraftwerk songs. Barrington Pheloung, composer for the *Inspector Morse* TV series, would sometimes reveal the name of the killer in an episode by using the rhythm of that character's name in the musical soundtrack. In his large-scale work *The Wreck of the Titanic*, David Bedford used the code patterns for key words actually transmitted from the ship as the disaster unfolded.

Activity 5

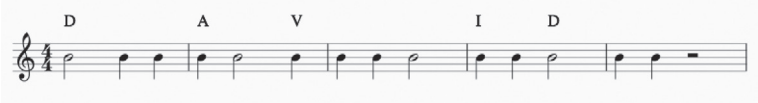
Display a copy of this chart on a screen and ask the students to work out how to clap the rhythm of their name as a Morse code pattern:



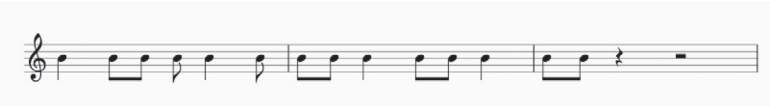
First they need to write down their name as a series of dots and dashes. For example:

D	A	V	I	D
– · ·	· –	· · · –	· ·	– · ·

It might be useful to clap this against a steady beat, such as a rhythm preset on an electronic keyboard. Others might find it helpful to translate it into notation, where a crotchet equals a dot and a minim equals a dash:



Once they are confident with clapping the rhythm, they can then start to speed it up so that it starts to sound a bit more funky. So 'David' would become:



I have found that students respond well to this challenge, since it makes strong connections with ownership and identity. They can then go on to develop this rhythmic pattern into a musical riff by adding pitches to the notes.

Activity 6

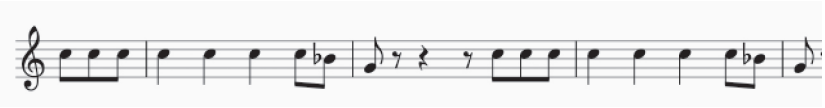
We can use some of the final Morse messages transmitted from the Titanic to create a graphic score that tells the story of the fateful day of its sinking through music.

Students should read an article from the BBC website that provides useful background and details of the actual Morse transmissions.

The graphic score might include images of waves, icebergs, seabirds, moon and stars, etc, which can all be interpreted musically. Some of the words from passengers' final messages can be added and set to music, providing a vocal element. The Morse messages can be set out and overlaid to provide interesting rhythm patterns and ostinatos. For example, the two distress calls CQD ('Come quickly, danger!') and SOS can yield some great patterns when used in combination. Ideas can be sketched out and then some students could be commissioned to produce a graphic score (perhaps as a project during art lessons). The final work can then be scanned and projected as an image or series of images on a screen for a large ensemble performance.

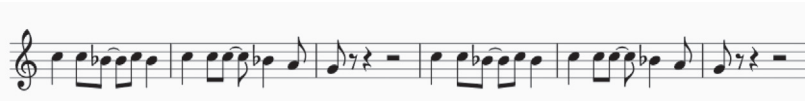
The SOS signal could appear as a graphic on the score as:

As a repeated riff, it might end up sounding something like this:



The CQD signal could appear as a graphic on the score as:

As a repeated riff, it might end up sounding something like this:



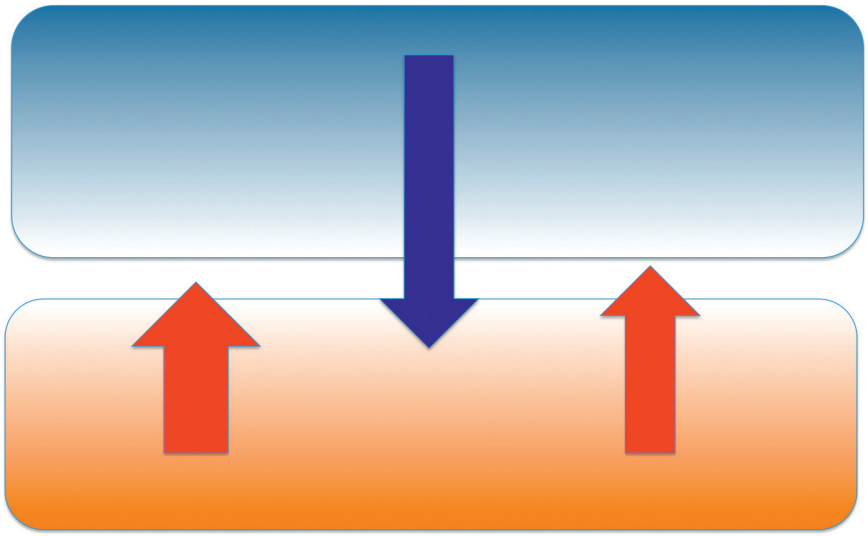
ARTWORKS

Artworks can often be regarded as 'found' graphic scores. Abstract paintings are particularly useful since they usually have clearly delineated shapes and patterns that are non-referential. The works of Klee or Kandinsky are recommended, as these artists would often acknowledge the importance and influence of music in their works. For this next activity, we are going to consider a painting by Paul Klee: *Greeting*, from 1922.

Activity 7

Access a copy of this picture from the internet and display on a board. As preparation for this work, you could ask students to do some research on this painter and perhaps involve the Art department in some cross-curricular activity.

The simplified schematic below shows the essential features of the work, but it's important that students work with copies of the original, which contains far more subtlety.



At a first glance, it's not at all obvious as to how this work can be used as a graphic score, but some guided classroom discussion should provide some useful pointers.

Here are some suggestions for questions to open up the discussion (with some possible responses given in brackets):

- Can you describe the background in this picture?
  - (The horizontal bands of colour can be divided into three groups. The lower bands are shades of orange/brown. There are three central bands of cream and above those some further bands of grey/blue.)
- What might these represent?
  - (Brown = earth, cream = neutral, blue = sky?)
- What sounds might be appropriate for these?
  - (Brown = low wooden sounds, blue = wind sounds?)
- How can we use the gradations of colour musically?
  - (The different bands could represent different pitch areas and timbres – the deeper colours for thicker sounds, the lighter colours more 'airy' sounds. The layers might suggest harmonies or sustained drones.)

These background ideas can be used to develop an accompaniment part for the piece.

Now let's consider foreground in the painting – the three arrow shapes. Consider also adding a timeline so that the score can be played from left to right.

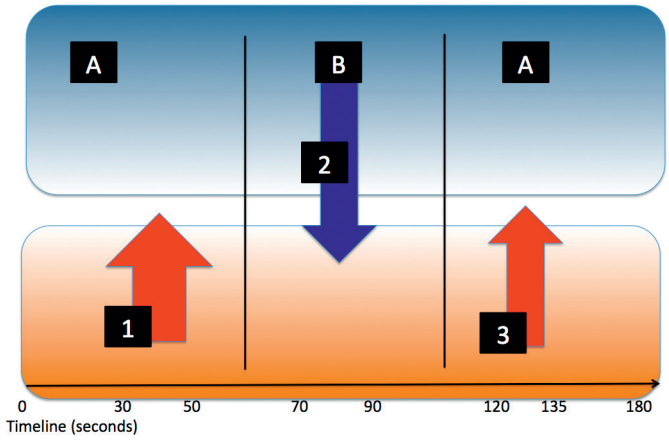
- How might we use these arrows in the piece?
  - (The three arrows could give us three sections. Since the arrows, going from left to right are red/blue/red, this might suggest an A B A form. The red arrows point upwards, so this might indicate melodies that generally tend to rise in pitch over time. The blue arrow does the opposite.)
- What about the positions of these arrows?
  - (The red arrows emerge from the orange/brown background, so these can be used to provide accompaniment for the A sections. The blue arrow descends through the layers for grey and blue, so this contrasting background could dominate in the middle section.)
- How can we use the relative sizes of the arrows to suggest musical material?
  - (The red arrows are short, so these might restrict musical phrases to a narrower pitch range than the longer blue arrow. The first red arrow is thicker than the second, so this might have a correspondingly longer duration.)

And so on. You can also move on to asking what instruments might be appropriate, what scales should be used, and many more ideas.

Of course, an open-ended discussion such as this might generate entirely different responses and may open up even further areas of enquiry. Consider using a flipchart to note down the responses to various questions.

The class can now go on to work in small groups to devise short pieces for small ensembles. They can either annotate copies of the original artwork or create new graphic scores based on the outcomes of the whole-class discussion. Make sure the responses captured on flipchart paper are displayed prominently for reference.

A performing score based on the hypothetical responses given above might look something like this:



The piece has been divided into three sections (A B A) and the three melody areas labelled (1 2 3). A timeline has been added, indicating a total duration of three minutes.

You can add notes for performers in a chart like this:

Timeline	Content	Notes
0-60	Section A backing.	Add notes here about instruments, players and musical material (scales, riffs, chords, rhythm patterns etc).
30-50	Add Melody 1.	
5 -70	Section A backing fades out. Section B backing emerges.	
70–90	Add Melody 2.	
90-120	Section B backing fades out. Section A backing emerges.	
120-135	Add Melody 3.	
135-180	Section A backing fades out.	

The actual musical material should be devised by the students in their groups – with teacher support. Choices will depend on instruments available and playing skills/experience of the students in the group. Vocal parts should also be encouraged.

A 'conductor' with pointer and a clock or stopwatch should indicate movement along the timeline as a guide for the players.

MATHEMATICS

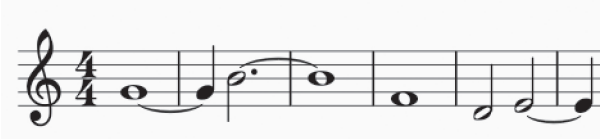
The earliest music made by man would necessarily have had limited resources and have been entirely intuitive. In order to give music form and the basis for development, ideas about shape and pattern are required. And these would come from a sort of logic and thinking that was in essence mathematical.

Since those very early days up to the present time, musicians have made use of mathematical ideas in developing approaches to scales and harmonic construction, as well as to rhythmic patterns and forms. Working with graphic scores, students can directly explore connections between mathematical ideas and musical composition and performing.

Activity 8

Create a pattern of, say, five numbers between 1 and 8, for example 5 7 4 2 3. Use these numbers for degrees of a scale and durations of respective notes. The table below uses degrees from a scale of C major. The first note, G, is the fifth note of the scale. The durations of each note are multiples of crotchets. So G is a five-beat note, B a seven-beat note, and so on.

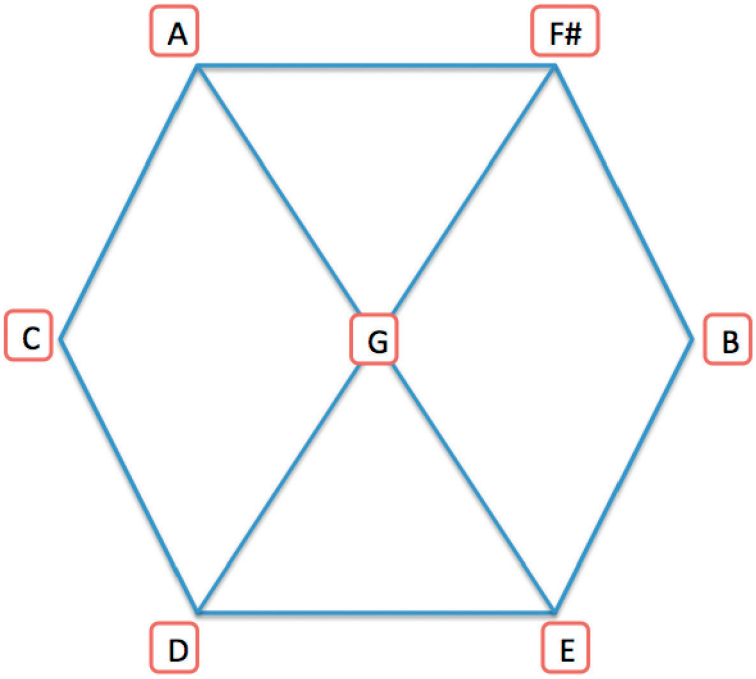
G	B	F	D	E
5	7	4	2	3



Initially, all musicians in the group play in unison or octaves. Once this is secure, the entries can be staggered so that musicians are playing in canon. Finally, a more ambitious approach might include working with two different number patterns. Construct scores that use either of the notation approaches above.

Students should them go on to devise their own number-pattern scores. These might be based on multiplication tables, prime numbers, the value of pi, the Fibonacci sequence or any other number pattern.

Geometric shapes



Polygons can be subdivided to create a collection of interesting shapes that can be used in a variety of ways for musical investigation. For example, by adding two straight lines to the hexagon above, we can create two equilateral triangles, two parallelograms and two rhombuses. I have added the note names from a scale of G major to the above.

- If we trace around the two triangles, we have three-note patterns: G D E and G A F sharp.
- If we trace around the two rhombuses, we have four-note patterns: G A C D and G E B F sharp.
- If we trace around the two parallelograms, we have five-note patterns: A G E B F sharp and A G E D C.
- If we trace around the hexagon we have a six-note pattern: A C D E B F sharp.

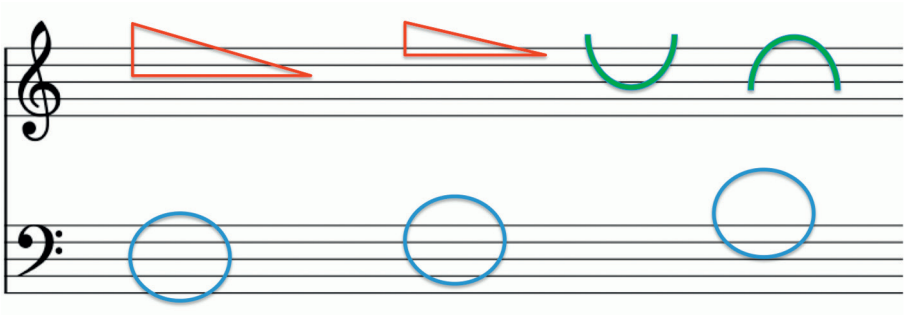
Of course, these patterns can begin on any note in the sequence.

In small groups, ask students to create a collection of chords, riffs and melodies using the above and look at ways of creating a performance piece using these materials. An alternative is an improvised performance using the note patterns created by these shapes.

Free-form melodies can also be added by following pathways between adjacent notes. These pathways can be determined by the players.

Experiment with using different shapes and different scales.

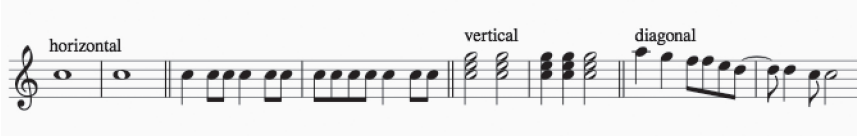
Geometric shapes superimposed onto scores



Geometric shapes are easy to create using drawing tools in Word, PowerPoint and many computer or app-based drawing programmes. If we place these shapes on a musical stave, we can use the properties of the shapes to guide and inform a series of note choices to build phrases and chords.

Here are some suggestions, based on the shapes shown above.

The **right-angled triangles** shown in red comprise a horizontal, vertical and sloping line. In the first one, the horizontal line is on the note C, so we could have a phrase repeating this note. The vertical line covers a note range from C to G – so we could stack some notes from this range vertically to build a chord. The diagonal line could indicate a descending phrase. Some possible examples are shown below:



Other three-sided figures, such as equilateral and isosceles triangles, can be used to explore elements of symmetry in music.

The **circles** could be used to devise cyclic patterns (ie repeating patterns) based on notes selected from within the range of the circle. Or notes could be chosen following the circumference of the circle. The circles to the right of the initial circle could indicate transposition upwards over time.

The first green **arc** might be interpreted as phrases that ascend then descend. The second arc shows an inversion of this approach.

So the shapes and their properties that our students are familiar with from their maths lessons, such as inversion, reflection and symmetry, also have their parallels in music.

Activity 9

Working in small groups, students should devise graphic scores based on drawing shapes onto staff paper. Use different colours for each instrument. The students should choose instruments for each shape depicted and work together to produce musically satisfying pieces that make use of the properties and relative placements of shapes on the staves.

PATTERNS IN NATURE

It is not just biologists who are fascinated by patterns in nature. Many artists, writers and musicians have been inspired to use scenes from nature as starting points for their works. Sometimes it's large-scale scenes such as seascapes or mountains that provide the stimulus. But often, by zooming in on the fine detail, we can also find patterns and structures that we can use to devise interesting graphic scores. Consider, for example, a simple leaf from an ash tree:

From a central stem, we have five pairs of leaflets and a single leaflet at the top. Or we can zoom in even further and consider a single leaflet, as shown below.

Activity 10

Project the above image onto a screen and ask the class to verbally describe or write down as many of the features of this shape as they can. They might initially find this difficult, but after spending some time looking and thinking about the image, they should come up with some observations similar to these:

- The leaflet has a pale-coloured central vein running its entire length.
- Pairs of veins slope off at angles on each side of this central vein. Sometimes they pair off from the same point. Sometimes they are staggered.
- The overall shape of the leaflet is a lance shape – a bit like a flattened rugby ball.
- The edge of the leaflet is serrated.
- The leaflet is a uniform green colour.

Then ask students: how might we translate some of this information into musical material?

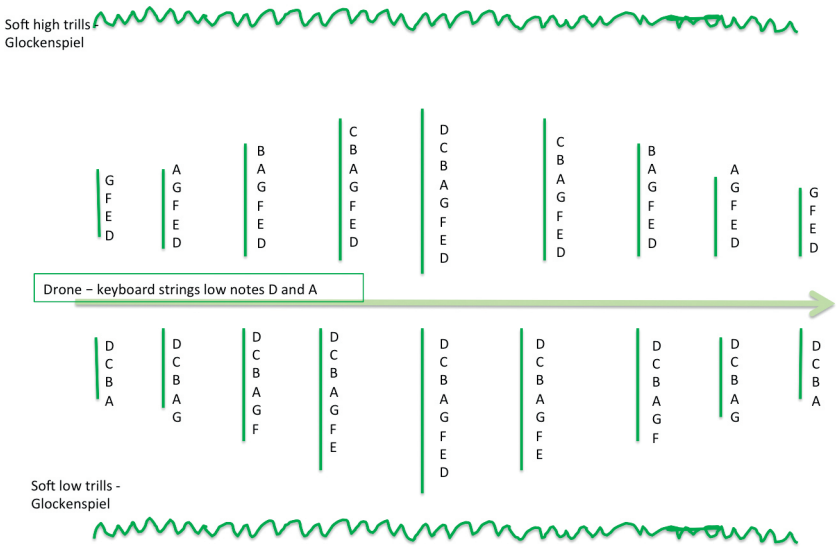
We might use the shape of the leaf to think about texture: thinner at the ends, becoming gradually fatter towards the middle. So we could start with just one layer of sound and gradually add other instruments. After the central point, these sounds gradually die away again. Alternatively, the shape might indicate a rise and fall of volume.

The serrated edge could be depicted by a jagged-sounding accompaniment pattern, or a series of trills. Running from left to right, this pattern rises then falls along the top edge, and vice versa along the bottom.

The thicker central vein could be played as a sustained drone or chord running throughout the piece.

The veins going off the central vein could indicate pairs of phrases that can be devised or improvised.

With this information we could 'translate' these ideas into a graphic score that might look something like this:



INTERPRETING THE SCORE

The main vein is represented by a continuous, sustained drone. This can be played on any combination of instruments capable of playing long, sustained notes. Synth sounds on keyboards are particularly good. To add variety to this layer of sound, consider varying the volume (rising towards the centre of the piece, then falling away), varying the number of instruments playing, and varying the registers of the notes.

The other background sounds are taken from the serrated edge of the leaflet. These can be represented as a succession of trills using notes from the D minor scale. Again, these could rise and fall in pitch during the course of the piece to evoke the lance shape of the leaflet.

The veins running off the central stem get progressively longer then shorter as we move from left to right. As the length of the veins increases, so does the number of notes. Above the stem we gradually add extra notes from the D minor scale, and we use a similar pattern for veins below the main stem from a descending D minor scale. As a conductor moves a marker from left to right, the players move from one group of notes to the next.

Note that some pairs are slightly staggered. Players can either improvise phrases from the note selections, or they may want to work out some phrases in advance. Alternatively, players can devise chords from the note options available at any given point.

Groups should rehearse and refine their piece until they produce a satisfying musical result.

Some groups might want to be even more creative and think about an appropriate mood for their piece. What sort of music might be evoked by the movement of ash trees swaying in the breeze? Are their any legends or songs about ash trees that might provide some reference musical material? For example, visit this site for some ideas. What about the particular shade of green of this leaf? Can colours suggests moods, as Kandinsky and other artists affirm? Read more on this idea here.

Activity 11

Are there any other starting points for music or graphic scores that can be suggested by natural forms? Ask students to bring in an object from the natural world – a stone, shell, feather, etc. Provide appropriate support in helping them develop graphic scores from their objects.

CONCLUSION

Playing from graphic scores is not necessarily a quick-fix option for producing worthwhile musical results. The players have to engage with the score and provide some degree of creative input. They have to think about interpretation. This may involve a high degree of collaboration with other performers and some improvisation skills.

But the effort is worth it, and the rewards can be high. These activities provide our students with many starting points for creating and performing original works that will often aspire to greater heights than can be achieved by use of standard notation alone. The guidance given in this resource should also be useful in helping students devise original graphic scores that can provide a sound basis for composing activities further down the line.

The connections with other curriculum areas, and the outside world in general, provide students with opportunities to make music that goes beyond the confines of the bubble of the music classroom. In other words, working with graphic scores allows and encourages students to make musical statements and explorations of issues that matter to them, and things that interest them, in the world beyond the classroom.