Glossary of musical and mathematical terms

Glossary of musical terms

accent	Accented notes should be played with emphasis and a short attack.
additive rhythm	An additive rhythm is one which is formed by combining small metrical units. It moves from one note (x time units long) to another note (y time units long) where the sum of x plus y forms the metrical pattern such as 2 + 3 + 4 beats.
arpeggio	A type of broken chord in which the notes are played in order from the lowest to the highest or vice versa.
atonality	The absence of key or tonal centre.
augmentation	A rhythmic device where note values are made longer, often doubled.
bars and barlines	Music is divided up into bars (sometimes known as measures) that contain a specified number of beats. The bars are separated by barlines.
beat	The underlying pulse.
bpm	Beats per minute
cadence	Cadences are used to punctuate music, either bringing a melody to a point of repose before going on, or bringing it to a close. Cadences are found at the end of musical phrases and are usually harmonised by two chords.
canon	A canon is based on the principle of strict imitation, in which an initial melody is imitated at a specified time interval by one or more parts. . If the imitation is exact and continues through the whole piece, the piece is called a canon. A section of a piece is described as canonic if the imitation prevails throughout the section
cantata	An extended piece of music for voices and accompaniment.

cantus firmus	A Latin term referring to a pre-existing melody used as the basis of a new polyphonic composition. It is found mostly in Medieval and Renaissance music.
celesta	A small keyboard instrument with an ethereal bell-like sound.
chord	The simultaneous sounding of two or more notes to produce harmony.
chord progression or chord sequence	A repeated sequence of chords.
chorus	A setting of the refrain of the lyrics. The chorus usually returns several times, and, in popular music, is likely to be the catchiest part of the song.
chromatic	Chromatic notes are those outside the prevailing major or minor key.
chromatic harmony	Chromatic harmony uses notes from outside the prevailing key to colour the chords
chromatic scale	A scale made up of all the twelve notes in an octave and formed entirely of semitones.
circle of fifths (cycle of fifths)	The circle of 5ths is represented by a circular diagram demonstrating the relationship between different keys. It shows a series of chords whose roots are each a 5th higher than the previous chord e.g. C-G-D-A. From any starting note the pitch is raised repeatedly until the starting point is returned to.
coda	A concluding section.
colotomic structure	Where specific instruments (such as gongs) mark the beginnings and ends of rhythmic cycles.
combinatoriality	A technique found in twelve-note compositions whereby a collection of pitch classes can be combined with a transformation of itself to form an aggregate of all 12 pitch classes.
common time	This refers to the commonly-used time signature of 4/4 and is denoted by the sign C at the beginning of a piece.
contrapuntal	In counterpoint.
counterpoint	A texture where two or more melodic lines are combined.
crescendo	Getting louder.
cross rhythm	The effect produced when two conflicting rhythms are heard together using different metres.
decitala	A Hindu rhythm
diatonic scale	The term diatonic scale is commonly used to denote both major and minor scales. Diatonic scales have seven notes. Major scales include five steps of a tone and two steps of a semitone.

diminution	A rhythmic device where note values are made shorter, often halved.
dissonance	Dissonant chords feel somewhat unstable or discordant.
divisive rhythm	A divisive rhythm system uses regularly repeated units (bars or measures) which can be divided into smaller parts (usually two, three or four beats).
dodecaphony	See serialism
dominant seventh	Dominant 7th chords are built on the fifth degree of the scale (the dominant). They are made up of four notes: the first, third and fifth notes of a given scale - plus a flattened 7th note from that scale.
drone	The extended sustaining or repetition of a note.
dynamics	The dynamics of a piece indicate the variations in loudness between notes or phrases.
enharmonic equivalent	Notes that sound the same but are written (or 'spelt') differently are said to be enharmonic e.g. E# and F where E# is the enharmonic equivalent of F
ensemble	A group of soloists, singers or instrumentalists, performing together.
figures or figuration	Short repeated patterns of notes with a distinctive shape (e.g. scales or arpeggio patterns), often used as decoration or accompaniment.
flat	A flat (♭) placed before a note lowers its pitch by one semitone.
forte/fortissimo	Loud/very loud
four-on-the-floor	A rhythmic pattern where the bass drum accents each of the four beats in a 4/4 bar. Often found in disco music.
fugal	A contrapuntal style using a good deal of imitation.
fugue	A contrapuntal musical form which follows a detailed set of rules: two or more voices use the systematic imitation of a principal theme (the subject) an answer and (sometimes) a countersubject in simultaneously sounding melodic lines (counterpoint).
functional harmony	A term used to describe the relationships between chords in music and the idea that chords have specific functions within a key. There is a clear hierarchy between the chords; the tonic serves as the home base and each of the others has its own level of status, the three most important chords being the tonic, dominant and subdominant.
glissando	An instrumental or vocal slide.
ground	A recurring melody, usually in the bass, accompanied by continuous variation in the upper parts
happening	An artistic event that combines elements of theatre, performance art, music, and the visual arts, often within a loose structure and without a plot.

harmony	Harmony is produced when any combination of notes are sounded together.
hemiola	A pattern that occurs when three beats are performed in the time of two or two beats are performed in the time of three.
hexachord	A six note pattern.
imitation	Imitation occurs when an initial melody (or rhythm) is imitated at a specified time interval by one or more parts.
improvisation	A performance where the music (or part of it) is made up on the spot.
instrumentation	The particular instruments used in a piece of music.
integral serialism	See total serialism.
interval	The distance between two notes.
intro	The opening section of a song.
isorhythm	A rhythmic technique using multiple repetitions of the same rhythm against different pitch patterns.
key	When a piece of music is based on a particular scale it is said to be in the key of that scale.
key signature	A sign at the beginning of each stave of music indicating the key of the piece.
loops and looping	Where a short section or sample, often rhythmic in nature, is constantly repeated.
metre	The organisation of regular pulses into patterns of strong and weak beats.
metric modulation	Where there is a change in pulse rate or time signature wherein a note value from the first section is made equivalent to a note value in the second section.
microtone	An interval smaller than a semitone.
modes of limited transposition	A term first used by the French composer Olivier Messiaen to denote scales which can be transposed a limited number of times before the original set of pitches reappears. Examples include the whole tone scale and the octatonic scale.
modulation	The change from one key to another.
motif	A short melodic or rhythmic idea.

note row	Note rows (also known as tone rows) form the basis of serialism. A note row uses all 12 notes of the chromatic scale and is the basis of the whole composition. There are four main permutations of the row. They are often referred to as the prime order, inversion, retrograde and retrograde inversion.
octatonic scale	The octatonic scale is made up of eight notes alternating tones and semitones
octave	The interval between the first and last notes of a major or minor scale. The two notes have the same letter name.
oral tradition	Where music is transmitted from one generation to another by word of mouth.
orchestration	The scoring of instruments used in an arrangement.
ostinato	A short musical pattern repeated throughout a section or complete piece. The plural is ostinati.
pentatonic scale	Pentatonic scales are made up of five notes. There are several different versions. They can be categorized as either hemitonic (with semitones) or anhemitonic (without semitones).
phase shifting or phasing	Where one part repeats constantly and another gradually shifts out of phase with it.
phrase	A subdivision of a melodic line.
piano/pianissimo	Quiet/very quiet
pitch	The word used to describe how high or low a sound is.
pizzicato	A string technique where the instrument is plucked with the fingers.
polymetric	Where different meters are combined simultaneously.
polyphony	A style of music that combines several distinct melodic lines simultaneously.
polyrhythm	Polyrhythms occur when two or more independent rhythms are heard together against the same pulse, such as one drum in triple time playing against another in quadruple time.
prime order or prime series	See note row.
pulse	The basic underlying beat in a piece of music to which we clap along or dance.
quintuple rhythm	Where rhythms are divided into five beats e.g. 3 + 2 or 2 + 2 +1.
range	The distance between the lowest and highest notes of a melody or composition.

register	A particular part of the range of a voice (e.g. chest or head voice) or instrument (e.g. high or low register).
retrograde	Where an existing melody or rhythm is played backwards.
rhythmic serialism	Where the principles of serialism are applied to rhythm.
riff	A short, repeated melodic or chordal pattern that may be heard at different pitches to fit in with the harmony.
sample	A recorded fragment of sound, newly recorded or from a pre-existing source.
scale	A pattern of notes arranged in order from low to high (or vice versa).
score	The written form of a musical composition.
semitone	A semitone is a measurement of pitch. There are semitones between all adjacent notes on a keyboard, whether black or white.
septuple rhythm	Where rhythms are divided into seven beats e.g. 3 + 4 or 4 +3.
serialism (dodecaphony or 12-note system)	The twelve-note system of serialism (sometimes known as dodecaphony) follows strict mathematical rules in the form of an algorithm. First of all a note row (or series) is composed that is the basis of the whole composition. There are four main permutations of the row – often referred to as the prime order, inversion, retrograde and retrograde inversion.
set theory	In music a set is a group of pitch classes, usually a 12-note set, it may also be a set of other musical elements such as durations or dynamics. Music set theory categorises musical objects and analyses their relationships.
sharp	A sharp (#) placed before a note raises its pitch by one semitone
slendro	A five-note scale used in Javanese gamelan music.
solmization	A sight-singing system where a set of syllables is matched to the degrees of the scale - ut, re, mi, fa, sol, la.
song cycle	A group of songs designed to be performed together as one unit.
sruti	A microtonal interval used in Indian music.
syncopation	The effect created when off-beat notes are accented
tala	A repeated cyclical rhythm pattern used in Indian music.
tempo	The speed of a piece of music.
texture	The number of parts in a piece of music and how they relate to one another. The texture of a piece refers to the overall picture of the sound.
timbre	Tone colour. The characteristic quality of a musical sound.

time line	A short repeated rhythm which is either clapped or played by a single or double bell.
time signature	A numerical sign found at the beginning of a piece of music telling you the number of beats in each bar and the note-value of the beat.
tonal ambiguity	This occurs when it is not clear what key a passage is in.
tonal harmony	Where the harmony is centred on diatonic keys.
tonality	The key centre or mode of a piece of music.
tone colour	Timbre. The characteristic quality of a musical sound.
total serialism (integral serialism)	Where the procedures of serialism are extended to the other aspects of the music beyond pitch, such as rhythm, dynamics, tempo, timbre and note attack.
transposition	Where a passage of music is written or performed at a different pitch.
triple time	Three beats in a bar.
triplet	Where three notes are played in the time of two.
twelve-note system	See serialism.
unison	Two voices producing the same pitch are said to be in unison.
verse and chorus	A standard song form where the verse and chorus usually alternate. The verses have the same or similar music but different text. The choruses usually repeat the same words and music.
whole tone scale	The whole tone scale is made up of six whole tones starting on either C or Db (its only transposition).

Glossary of mathematical terms

1/f distribution	In terms of noise, $1f$ noise (or fractal noise) is a signal with a frequency spectrum such that the power per frequency interval is inversely proportional to the frequency (symbol f) of the signal.
180^0 rotation	A function that moves each point of the plane through an angle of 180^0 about a fixed point.
phi – Φ	The Greek letter phi – Φ, an irrational number, is used to denote the value of the golden ratio.

algorithm	Where a set of precisely described instructions or routine procedures are designed to be applied systematically through to a conclusion in a number of steps.
Brownian motion	A continuous-time version of the random walk displayed by minute particles of solid matter when suspended in a fluid or a gas resulting from their collision with the fast-moving molecules in the fluid.
Butterfly Effect	The way a small change in one state of a deterministic system can bring about large differences in a later state with the potential to render long-term predictions impossible.
Cantor set	The Cantor set, sometimes known as the middle third Cantor set, is obtained by repeatedly removing the middle thirds of intervals. Each stage of the construction is obtained by removing the middle third of the previous stage.
cent	A logarithmic unit of measurement for the ratio between two frequencies.
chaos theory	Chaos theory (the science of dynamical systems) focuses on the behaviour occurring in a system under iteration and is the study of apparently random or unpredictable behaviour in systems governed by deterministic laws.
cipher	A cipher uses an algorithm, which usually replaces a letter or other single character with another, to convert the plaintext, a message, for example, into another text known as the ciphertext.
coding	Coding theory refers to the reliable transmission of data and to the detection of and correction of errors in its transmission.
combinatorics	The study of the enumeration, combination and permutation of sets of elements and the mathematical characteristics of their properties.
cryptogram	An enciphered message written in code. The original message is called the plaintext and the enciphered message is called the cryptogram.
cryptography	The practice of writing in code or cipher aiming to conceal information.
deterministic system	A system in which no randomness is involved in the development of future states of the system. If the initial state is known exactly then the future state could, in theory, be predicted. A model which incorporates random elements or processes is said to be stochastic, otherwise it is said to be a deterministic model.
devil's staircase	In mathematics a devil's staircase (sometimes referred to as the infinite staircase or the Cantor function) has unequal ascending steps constructed by using, for example the recursive 1/3 to 2/3 proportions of the most common middle-thirds Cantor set.
dynamical system	A dynamical system is a mathematical system whose state is uniquely specified by a set of variables and whose behaviour is described by predefined rules.
encryption	The process of converting the plaintext to ciphertext is called encryption, with decryption denoting the reverse process.

Euclidean algorithm	The Euclidean algorithm is a systematic repetitive procedure used for computing the greatest common divisor (GCD) of two integers.
Euclidean rhythm	In the Euclidean rhythm $E(k,n)$, k is the number of ones (onsets), and n (the number of pulses) is the length of the sequence (zeroes plus ones).
Fibonacci series	A summation series in which each number is the sum of the two which precede it.
fractal	Fractals belong to a class of curves or complex geometric shapes where each part has the same statistical character as the whole, that is, it is made up of smaller scale copies of itself.
frequency	Frequency (f) is the number of occurrences of a repeating event per unit of time. Frequency is measured in hertz (Hz). A hertz is equal to one event per second. For cyclical phenomena such as sound waves frequency is defined as the number of cycles or repetitions per unit of time.
frequency analysis	Part of descriptive statistics which measures the number of times an event occurs.
frieze pattern	A repeating pattern of elements arranged along a line or in a strip.
Gaussian distribution	Gaussian distribution (often known as normal distribution) is a very common continuous probability distribution and is the basis of a large proportion of statistical analysis.
GCD	See greatest common divisor.
glide	A form of symmetry where a figure is reflected and then translated by being shifted horizontally.
Golden Section	The unequal division of a line into two parts such that the ratio of the smaller part to the larger is the same as that of the larger to the original whole. This ratio is approximately 1:1618.
greatest common divisor (GCD)	The GCD of two or more numbers is the greatest common factor number that divides them exactly.
group theory	A branch of abstract algebra, which looks at the main features of a group, from both the point of view of its elements and its group operations.
infinite	Having a size or absolute value greater than any natural number (positive integer).
integer	A whole number (not a fraction) that can be positive, negative or zero. Positive integers are sometimes known as natural numbers.
invariance	A property or quantity is said to be invariant if it is not changed by one or more specified operations or transformations.
irrational number	A real number which cannot be expressed as an integer or as a quotient of two integers. Irrational numbers have infinite, non-repeating decimals.
iteration	A method uses iteration if it yields successive values by repetition of a certain procedure.
Latin square	A square array of symbols arranged in rows and columns such that each row or column of the array contains each symbol precisely once.

LCM	See least common multiple.
least common multiple (LCM)	The LCM of two positive integers is the smallest integer that each number divides into evenly.
Lucas summation series	An integer sequence which has the same recursive relationship as the Fibonacci sequence, where each term is the sum of the two previous terms, but with different starting values.
magic square	A square matrix where a different positive integer is written in each cell, each occurs only once. The 'magical' quality is that each horizontal, vertical and diagonal row adds up to the same number.
Möbius strip	A 2-dimensional strip where one continuous side is formed by joining the ends of a rectangle after twisting one end through 180°.
modular arithmetic	A system of arithmetic for integers which gives the remainders in division.
Moiré patterns	Geometrical designs produced when a set of straight or curved lines is superimposed onto another set.
multiplier	The number or term by which another is multiplied in multiplication.
***n* factorial**	The product of all positive integers less than or equal to *n*.
prime number	A number that can only be divided by itself and 1 without remainders. Numbers that are relatively prime have no common factors other than 1.
probability	The probability of an event is a measurement of the possibility of the event occurring.
randomness	Having no specific pattern, purpose or principle of organization.
random numbers	Random numbers have two main properties: all of the numbers or digits in the numeric sequence will, in the long run, occur equally often; and the occurrence of any one number or digit in a particular position in the sequence is no guide to the occurrence of the number or digit later in the sequence.
random walk	A process in which a sequence of discrete steps of fixed length is described in terms of the movement of a particle, so in a one-dimensional random walk the state of the process is described as a position on a straight line.
ratio	The quotient of two numbers or quantities giving their relative size. The ratio of x to y is written as x:y (or x/y) and is unchanged if both quantities are multiplied by the same quantity.
rational number	A rational number is one which is either an integer or can be written as a ratio (or quotient) of two integers e.g. 1, 7, 544 or 2/3.
recursive construction	Recursive construction involves repeating the same a simple step over and over again.
reflection	When an object has reflectional symmetry it can be divided into two pieces which are images of each other. The dividing line is known as the axis of symmetry. This could be the on the horizontal x axis (vertical reflection) or the vertical y axis (horizontal reflection).

rotation	When an object has rotational symmetry it can be turned about a fixed point whilst keeping the same overall shape.
Sator square	An ancient palindromic 5 x 5 Latin square using the letters S A T O R that can be read horizontally, vertically and backwards.
scale symmetry	An object has scale symmetry when it can be expanded or contracted whilst keeping the same overall shape.
self-similarity	A self-similar object is one whose component parts resemble the whole.
set theory	A set is a well-defined collection of objects which are referred to as elements or members. Set theory is the study of the properties of sets and their relations.
stochastic process	A process in which the steps are governed by rules of probability. Stochastic processes are random and non-deterministic; the next state of the environment is not fully determined by the previous one
summation series	An infinite sequence in which each number is the sum of the two which precede it.
symmetry	A geometric object or shape is symmetric if it can be divided into two or more identical parts and is invariant under transformation. There are several different types of transformation; the main types are reflection, rotation, translation, and scale.
translation	When an object has translational symmetry it can be shifted a fixed distance in a fixed direction whilst keeping the same overall shape. This can happen in two ways. It can be shifted from left to right – horizontal translation or It can be shifted upwards or downwards – vertical translation.
variable	An expression, usually denoted by a letter that is defined for different values within a given set.
von Koch curve	A fractal curve, the main von Koch curve contains many tiny von Koch curves which are made up of smaller scale copies of itself. This property is known as self-similarity.
von Koch snowflake	The von Koch snowflake is developed from the von Koch curve. Instead of one line the snowflake begins with an equilateral triangle. The steps in creating the Koch curve are then repeatedly applied to each side of the equilateral triangle, creating a 'snowflake' shape.
x-axis	The horizontal axis of a graph.
y-axis	The vertical axis of a graph