

A pair of dark-rimmed glasses and a black pen are resting on a sheet of musical notation. The glasses are positioned in the upper right, and the pen is in the lower left. The musical notation is visible in the background, with various notes and symbols.

(ENG) Math of Music

Introduction

Step 1 - Motivational Stage

Step 2 - Investigational Stage

Step 3 - Consolidation Stage

Introduction



#Online activity #In-class activity #Inquiry-based learning
#Teamwork #Music

This somewhat demanding activity shows how mathematics is needed in composition. The examples are from the field of new music.

Learning Objectives

- ☐ understand the connection between music and mathematics
- ☐ gain experience in the work of a composer who essentially uses mathematics
- ☐ create their own understanding of the connection between new music and mathematics

ACTIVITY DETAILS

Activity Details

Connection of the activity with Art —

Music, new music, composing music



Link to local, national School Curriculum —



Equipment required —

- Internet connection



Duration of activity —

45 minutes



Sources

—

Step 1 - Motivational Stage



Your pupils will get to know the connections between mathematics and composing music with the help of a short interview and Youtube videos.

Ask the students the following questions:



“ How can mathematics help in composing? ”



*“ How far can math problems be used as elements of new
music? ”*

Step 2 - Investigational Stage



For start, the pupils read the short interview below, presenting a Finnish composer Juhani Nuorvala.

What does a composer need mathematics for?

When the Finnish new music composer Juhani Nuorvala thinks about the connection between mathematics and composing, he thinks about the arrangement of tone and rhythmic structures.

- It's all about systems. Many composers have used, for example, Fibonacci numbers and the golden section model as the structure of their works. The golden ratio is a classic beauty law that creates an aesthetically satisfying result. In music, it can be implemented, for example, in such a way that the high point of the composition is placed slightly above the halfway point.

- Tom Johnson is an American composer over 80 years old. He brings mathematics to composing in a particularly interesting way. He uses mathematical problems as his starting point, to which the composition offers a surprising and often funny solution. Johnson's compositions usually have a spoken part where the performer explains the features of each mathematical problem at hand. Thus, Johnson's works are often humorous and spirited at the same time.

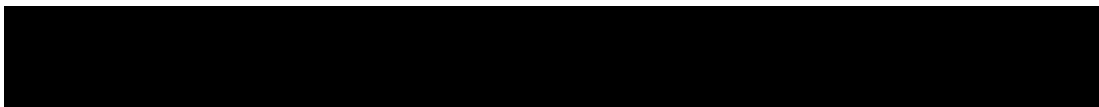
- In my own compositions, I am interested in tuning systems, and they essentially include fractional and whole numbers. When I teach composition at the university, the course on tuning systems always starts with a review of mathematics for this reason.

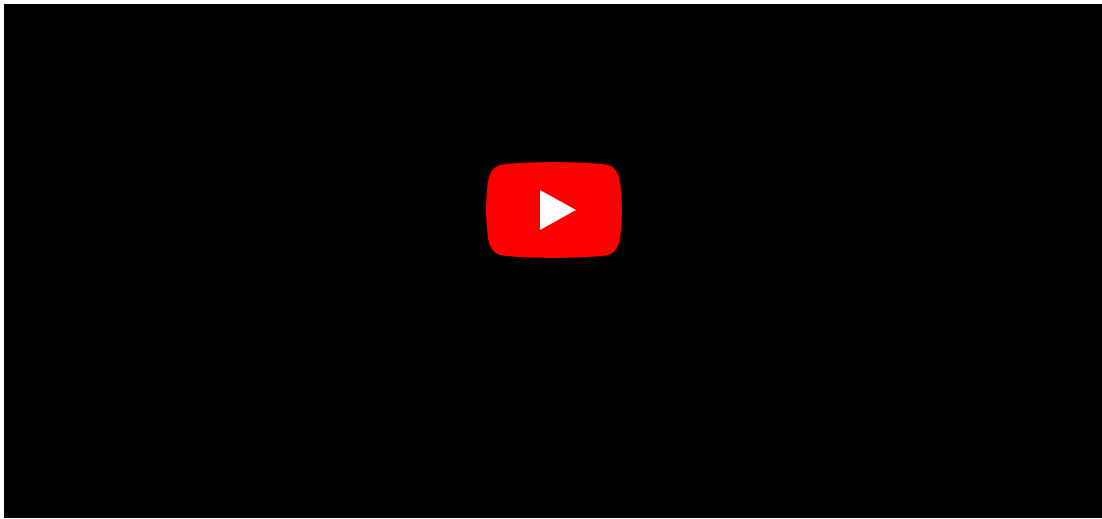
STUDENTS' TASKS

1

Task 1

Pupils find Tom Johnson's Narayana's Cows online





At the beginning of the video, Johnson talks about his work and at the end it is presented.

Pupils explain what is interesting and/or surprising about the composition Narayana's Cow. They practice presenting their explanation in exactly three minutes.

2

Task 2 (faster learners)

This is a more demanding task, which is particularly suitable as supplementary content for fast learners.

The pupils familiarize themselves with what musical notation means by finding materials from the Internet.

Then they find a notation of a well-known song and turn the notes into numbers. Finally, they give that new number notation they made to someone else. Is the song still recognizable?

3

Task 3

Let pupils read about the [harmony of the spheres](#).

This motif of connecting music and (heavenly) mathematics/proportions was popular also in the visual arts, as in an Italian picture from our collection that shows a bunch of instruments and a celestial globe. [Read more](#).

Step 3 - Consolidation Stage



Pupils form a group in an online meeting. They present to each other their own perspectives on Narayana's Cows, which they created in task 2 and rehearsed for three minutes. They are reminded to comment especially on the importance of mathematics in that composition.

End of the activity

EXIT