PART V: Literature & Mathematics

AGE RANGE: 16-18

TOOL 53: MATHEMATICAL POETRY

Sandgärdskolan

Co-funded by the Erasmus+ Programme of the European Union

Educator's Guide

Title: Mathematical poetry

Age Range: 16-18 years old

Duration: 1,5 hours

Mathematical Concepts: Arithmetics, infinity

Artistic Concepts: Poetric meter, verse foot

General Objectives: This task will make you and your pupils see the mathematical logics behind some of the oldest examples of literature. You will also see that the mathematical sequencing helped in remembering and understanding the text
Instructions and methodologies: Read the text in the tool and do the tasks.

Resources: This tool provides examples of poetry. It also explains some classic verse foot and gives a couple of hints on how to work beyond this tool. You will not need anything else than pen and paper (or computer if you prefer that writing) to do the tasks.

Tips for the educator: Focus on the combination of literature analysis and mathematics. The maths as such may seem simple, but combined with the literature, it will become a challenge that will help you understand metrics in literature and mathematics in a new way.

Desirable Outcomes and Competences: At the end of this tool, the student will be able to:

- Understand literary metrics better.
- Have a deeper understanding of some infinite numbers.

Debriefing and Evaluation:

Write 3 aspects you liked about this activity:	1. 2. 3.
Write 2 aspects that you have learned	1. 2.
Write 1 aspect for improvement	1.

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Introduction

There is a mysterious connection between mathematics and poetry, both of which can be enhanced by each other. In some contexts, poetry is used to remember certain mathematical contexts and sometimes the mathematics is used to get structure and rhythm in the poem which makes it easier to remember and recount.

One of the oldest mathematical poems comes from a Sumerian temple. Sumer was a cultural area in southern Mesopotamia, now Iraq, the history of which started about 3000 BC. The text "The herds of Nanna", from which you can see an excerpt here, is a poetic hymn to the moon goddess Nanna and was written about 1800 BC:

The cows are driven together in herds for him.
His various types of cow number 39600.
His young cows and calves number 108000.
His young bulls number 126000.
The sparkling-eyed cows number 50400.
The white cows number 126000.
The cows for the evening meal are in four groups of five each.
Such are the various types of cow of father Nanna.

The hymn is interpreted as a desire to receive divine help in keeping the bill of cattle and crops. The poem can be seen to support the idea that the drive to develop both numbers and a written language and by extension - mathematics and literature, was a need to be able to document wealth, crops and livestock. Another example of poem about counting cattle is Archimedes (c. 300 BC) "The cattle problem",

Compute, O friend, the number of the cattle of the sun which once grazed upon the plains of Sicily,
divided according to color into four herds,
one milk-white, one black, one dappled and one yellow.

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The number of bulls is greater than the number of cows,
and the relations between them are as follows:

White bulls = $\left(\frac{1}{2}+\frac{1}{3}\right)$ black bulls + yellow bulls,

Black bulls = $\left(\frac{1}{4}+\frac{1}{5}\right)$ dappled bulls + yellow bulls,

Dappled bulls = $\left(\frac{1}{6}+\frac{1}{7}\right)$ white bulls + yellow bulls,

White cows = $\left(\frac{1}{3}+\frac{1}{4}\right)$ black herd,

Black cows $\left(\frac{1}{4}+\frac{1}{5}\right)$ dappled herd,

Dappled cows $\left(\frac{1}{5}+\frac{1}{6}\right)$ yellow herd,

Yellow cows $\left(\frac{1}{6}+\frac{1}{7}\right)$ white herd."

The task is to calculate the number of animals in the sun god's cattle herd. He sent the problem to the mathematician Eratostenes of Cyrene in Alexandria, Archimedes promised honour and wealth to the one who solved the problem. The task has several possible solutions, the first known solution was made in 1880. It was not until 1965, with the help of computers, that all the numbers in the answer could be printed!

Glossary

Foot. A combination of one stressed and one or two unstressed syllables that make up a part of a line in classic poetry.

Stanza. A group of lines in a poem that is divided from another group with a blank line. Similar to a paragraph in everyday writing.

Syllable. A part of a word consisting of a vowel sound and its corresponding consonants.

Verse. In this text referring to poetry in general. Not to be confused with stanza.

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The Math behind poetry

Historically, many dramas and epics, i.e. narrative literature, are written in verse. For example, "The Illiad" and "The Odyssey" are written on hexameter, a six-footed verse with falling rhythm. The emphasis is on the first syllable and each line is divided into sections of six feet.

"Ah me, that it is destined that the dearest of men, Sarpedon,
must go down under the hands of Menoitios' son Patroclus."
Homer. "The Iliad." Richmond Lattimore, translator. Chicago: University of Chicago Press (1951).

Also, Tove Jansson (author of the Moomins) has written on hexameter,
"Fearless I have always been (pause)
And a lion I happily behead"
From "Moominsummer madness"

In England, it is common to use blank verse as a dramatic verse. It is a form of non-rhyming sentences based on groups of five that conclude with a non-emphasized sixth part. Shakespeare wrote a lot on blank verse, for example:
"To be/ or not/ to be/ that is/ the quest/ion."

Writing mathematical poetry

There are many easier ways to write mathematical poetry than using hexameter or blank verse though.

Acrosticon (Name Poem): The beginning letters of each line form a word or sentence.

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For example:

Makes me use my brain!
Arithmetics is fun!
Takes time to learn!
Hurray for MATHS!

Haiku: A short poem form from Japan. It consists of three rows with the distribution of syllables 5-7-5 (five syllables in the first row, seven in the second and five in the last row). In a haiku, the content is usually more important than the exact number of syllables, so if there is a syllable missing or if it becomes one too many syllables, it doesn't matter that much.

For example:

Parallel lines
Two lines side by side
Never meeting is their fate
Same slopes are their curse

Limerick: Named after the Irish city of Limerick. A verse form where the number of syllables is not so important, the important thing is that the limerick follows the AABBA rhyme scheme.

- The first, second and fifth lines should rhyme
- As well as the third and fourth.
- Usually, the limerick is a little humorous and preferably the first line should end with a geographical name.

For example:

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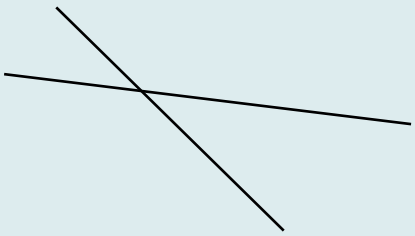
There was a guy in Seventh Heaven.
Who thought 4+3 was eleven.
Little did he know that he wasn´t right.
His friends said nothing to fright…
For 4+3 isn´t eleven, it´s seven.

Free verse: Free verse is not bound by rules, rhyme or verse. That does not mean that it completely lacks form though - rhythmic figures and sound effects often occur. Thus, the poem does not lack rhythm just because it lacks a regular one.

For example:



We were intersecting
Meant to cross once
And destined to part forever

Number poetry: Let the figures in a known number represent the amount of letters on each line. We can take Pi, 3.1415926 ... as an example. The first line should contain three letters, the next one, the next four, and so on.

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It could be like this:

Pi(e)

3 Yum!

1 I

4 Love

1 A

5 Tasty

9 Well baked.

Examples of other numbers are Fibonacci's sequence, $\sqrt{2}$ and e.

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TASKS

1. Write a poem that is an aid to remembering any mathematical rule.
   For example:

Adds up to 9?
Everything´s fine.

10 or more?
Take ten next door, and
leave the extra on the
floor.

2. Write some form of poem that describes a mathematical concept, such as the poem
   about the intersecting lines above.

3. Write a mathematical poem based on the mathematical sequence pi or e (just as in
   the example above)

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Moominsummer madness

Jansson, T. (1955). "Moominsummer madness". London: Penguin Books Ltd

The Cattle problem

https://en.wikipedia.org/wiki/Archimedes%27s_cattle_problem

The Herds of Nanna

http://etcsl.orinst.ox.ac.uk/section4/tr41306.htm

The Illiad

Homer. "The Iliad." Richmond Lattimore, translator. Chicago: University of Chicago Press (1951).

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