

PART V: Literature & Mathematics

AGE RANGE: 13-15

TOOL 49: Pilish (π -lish) Writing

SPEL – Sociedade Promotora de Estabelecimentos de Ensino

π number

(Source: Mathematikum Museum, Gießen (2019))



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Educator's Guide

Title: Pilish (π -lish) Writing

Age range: 13-15 years old

Duration: 2 hours

Mathematical concepts: Pi, perimeter, area, circumference, circle, radius.

Artistic Concepts: Pilish writing method

General objectives: To be able to write a small text in Pilish and use Pi to calculate perimeters and areas.

Instructions and Methodologies: In addition to explaining theoretical concepts, it is important to use videos and texts to better understand the contents.

Resources: pen and paper;

Tips for the education: Begin by explaining the theoretical concepts and, if possible, use images, texts and videos for a more effective explanation. Show / elaborate some texts in Pilish. For a better understanding of the contents and so that the students can then solve the exercises alone, solve examples of exercises that involve the calculation of perimeters and areas. If needed, bring a compass for a better demonstration.

Learning Outcomes and Competences:

At the end of this tool, the student will be able to:

- Write a small text in Pilish;
- Calculate the perimeter of a circumference;
- Calculate the area of a circle.

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.

Introduction

There is a wide range of books that address Mathematical concepts and are available worldwide. Apart from the traditional school handbooks, there are books that dedicate their whole content to a branch of Mathematics, to a set of topics, or even to unsolved theorems, conjectures or paradoxes. Besides these, there are books that, even though do not completely focus in Mathematics, describe a story and make use of Mathematical concept(s) as a means to solve a mystery or a logical situation. In addition to this kind of literature books, there are also those which build a whole history based or according to a mathematical concept.

One very good example is the book "Not A Wake", written by Michael Keith in "Pilish", which will be covered in this tool. Are you not familiar with "Pilish"? That is only natural! However, at the end of this tool, you will get to know this concept and to explain it to your friends in simple terms. Moreover, you will be able to write some texts using this concept!

Pi (π) as a writing concept

Many books mention the Pi (π) number, while others offer poems and verses dedicated to it. And then, there are those that go beyond and write an entire book in “Pilish”, which is a way of writing in which each successive word has a total number of letters that match the digits of the Pi (π) number

(3,141592653589....). Hence, Pilish is a very peculiar writing technique that follows a restrict rule/pattern. It is believed that the first examples of this type of writing emerged in the early twentieth century. One of the best known is the phrase attributed to the English physicist James Jeans: “How I need a drink, alcoholic in nature, after the heavy lectures involving quantum mechanics!”. By following the rule, the first word has 3 letters, the second has 1, ..., and the fifteenth has 9, which corresponds to the first 15 digits of the Pi number.

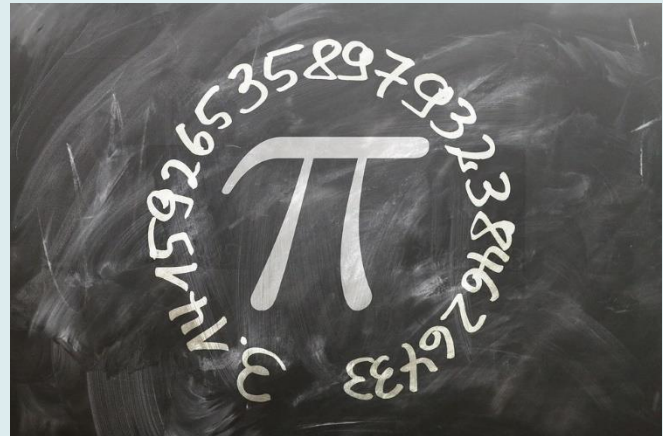


Fig. 1 – Representation of π

(Source: <https://pixabay.com/illustrations/pi-board-school-district-diameter-1453836/>)

In the meantime, a constraint regarding the digit number 0 came up, and so it was suggested that a word with 10 letters should make up for it. This new “version” of Pilish writing, which became known as “Basic Pilish”, states that a word with n letters represents:

The n digit if $n < 10$;

The 0 digit if $n = 10$.

Two other setbacks were later detected. Firstly, the digits 1111211 demanded several consecutive words with one or two letters to be written; secondly, words with more than 10 letters could not be used. To solve this constraint, a third rule was created.

It became known as “Standard Pilish”, stating that each word of n letters represents:

Two consecutive digits if $n > 10$.

Therefore, for instance, a word with 12 letters, such as "sleepwalking", represents digits 1 and 2, respectively.

There are also some punctuation rules. As Michael Keith states :

“If a word contains one or more apostrophes, eliminate them and close up the resulting space. So ‘couldn’t’ is treated as if it were ‘couldnt’ and therefore counted as a 7. The alternative, to treat apostrophes as delimiters, is clearly not the right choice, since then ‘couldn’t’ would become two digits (6,1).” (Keith, M. (n.d.), “Writing in Pillish”; retrieved from <http://www.cadaeic.net/pilish.htm> (16/07/2019)).

Additionally, he adds that:

“Any character that is not a letter or an apostrophe is a delimiter, which is equivalent to saying that it is treated as if it were whitespace.” (Keith, M. (n.d.), “Writing in Pillish”; retrieved from <http://www.cadaeic.net/pilish.htm> (16/07/2019)).

Furthermore, one could also include numbers that sometimes might come up and correspond the number of digits to a corresponding PI digit. To clear this up, two Pilish categories were defined (Keith, M. (n.d.):

- **“Alphabetic Pilish”**, in which words consist only of letters. Therefore, ignoring all numbers, that is, if any number shows up in a Pilish composition, it will not count towards any Pi digit; and
- **“Alphanumeric Pilish”**, in which words can consist of letters and numbers. That is, if the number “2019”, a number with 4 digits, is used in a Pilish composition it will correspond to a digit 4 of the Pi number. Likewise, writing “1st” will count towards a digit 3 of the Pi number.

Back to the texts written in Pilish, in 1995, Michael Keith, rewrote Edgar Allen Poe's poem “The Raven”, in Pilish, thus encoding the first 740 digits of the Pi number, in a poem that became officially known as “Near a Raven”.

In 1996, the author uses his adaptation for his work “Cadaeic Cadenza”, a story written according to the Standard Pilish and Alphanumeric Pilish rules, in which the first 3835 digits of the Pi number were encoded.

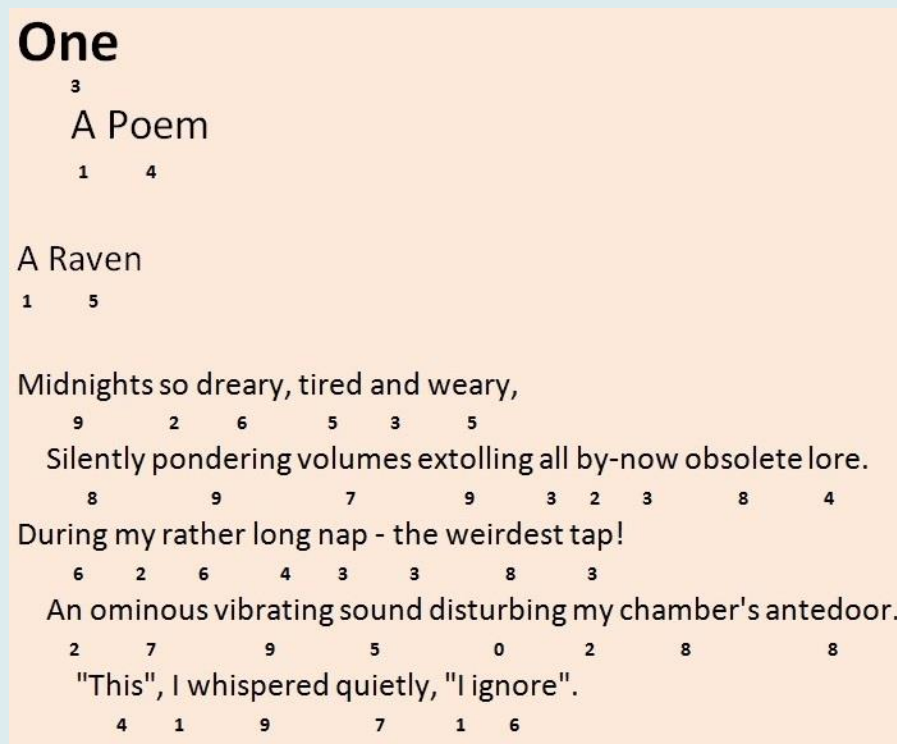


Fig. 2 – Excerpt of “Cadaeic Cadenza” by Michael Keith (1995) displaying the number of letters in each word, in accordance to the Pi digits (Source: <http://myzlog.blogspot.com/2016/03/the-cadaeic-cadenza-is-short-story-that.html>)

In 2010, Mike Keith beats his own record by writing the book “Not A Wake”, according to the Standard Plish and Alphanumeric Plish rules, only this time the book covers the first 10000 digits of the Pi number.

In Mathematics, the concept of Pi as the ratio of a circle’s circumference to its diameter is known since Ancient Age, but it was only in the eighteenth century that Lambert proved that Pi is an irrational number.

From the twentieth century onwards, more precisely after 1949, with the aid of computers, an increasing number of decimal places for Pi were discovered. The current record was set in January 2019 by Emma Haruka Iwao, a Google Japan employee, who set 31.4 trillion (31 415 926 535 897 to be more accurate) of the mathematical constant

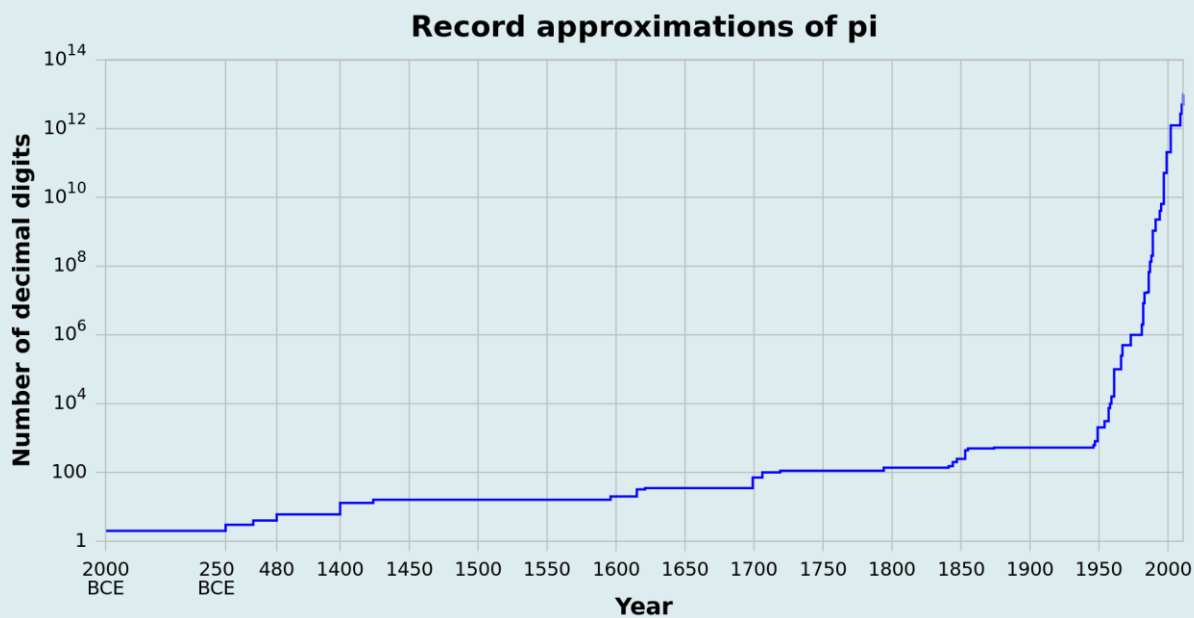


Fig. 3 – Historical evolution of the record precision of numerical approximations to Pi, measured in decimal place (Source: https://en.wikipedia.org/wiki/Approximations_of_%CF%80#/media/File:Record_pi_approximations.svg)

Glossary

Pilish - a style of constrained writing in which the number of letters in a series of successive words match the digits of the number π (pi).

Constrained writing – a literary technique in which there are restrictions that make the writer follow certain rules or patterns.

The Math behind the Pi-ish (π -lish) Writing

The **Pi** number (traditionally represented by the Greek letter π) represents the constant ratio between the perimeter of any circumference and its diameter. Pi is the most famous irrational number in history.

To facilitate calculations, the value 3.14 is used most of the times as an approximation of Pi.

However, since it is an irrational number, Pi is an infinite non-periodic decimal (meaning that every possible numerical combination eventually shows up in the decimals of Pi). Thanks to computer technology, it has already been possible to determine a more exact approximation with billions of decimal places.

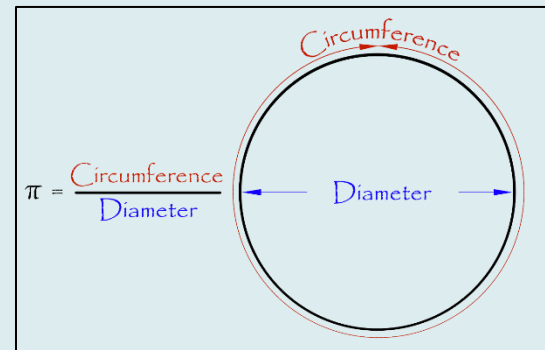


Fig. 4 – Constant ratio π
(Source: <http://project314.org/images/-314/PIRatio.png>)

Applications of Pi

As mentioned earlier, the number Pi is the constant ratio of any circle's circumference to its diameter, so the Pi is bound to the concept perimeter of a circle and is also used in the calculation of the area of a circle, as well as volumes of other solids with curved surfaces. In this tool, the first two applications will be covered.

Perimeter of a circumference

The **perimeter**, P , of a circumference is represented as: $P = \pi d$ or $P = 2\pi r$, where d is the diameter and r is the radius of the circumference.

Area of a circle

The area, A , of a circle is represented as: $A = \pi r^2$, where r is the radius of the circle.

TASKS

TASK 1



Convert the following text (written in Standard Polish) in the first 21 digits of the number Pi.

“Now I fall, a tired suburban in liquid under the trees,
Drifting alongside forests simmering red in the twilight over Europe.”

TASK 2



Write a text or a poem in Standard Polish with, at least, 20 words.

TASK 3



Calculate the perimeter (the exact value and the approximate value using $\pi \approx 3,14$) of a circumference with a radius of 5 cm.

TASK 4



Calculate the area (the exact value and the approximate value using $\pi \approx 3,14$) of a circle with a radius of 10 cm.

LEARN MORE...

Pi

<https://pt.wikipedia.org/wiki/Pi>

Calculating the value of Pi

<https://www.youtube.com/watch?v=dBoG4eRSWG8>

Radius, diameter, circumference & π

<https://www.khanacademy.org/math/basic-geo/basic-geo-area-and-perimeter/area-circumference-circle/v/circles-radius-diameter-and-circumference>

Writing in Pilish

<http://www.cadaeic.net/pilish.htm>

Book "Not A Wake" by Mike Keith

<http://www.cadaeic.net/notawake.htm>