

CLIL Pi Number

Περιγραφή διδακτικού σεναρίου

Ιφιγένεια Κωφού & Ελένη-Μαρία Φυτιλή

2^ο ΓΕΛ ΘΕΡΜΗΣ «ΓΙΩΡΓΟΣ ΙΩΑΝΝΟΥ», 2024

Με αφορμή την ημέρα του π (14/3), πραγματοποιήθηκε το παρακάτω 2ωρο διδακτικό σενάριο σε ένα τμήμα της Β΄ Λυκείου του 2^{ου} ΓΕΛ Θέρμης «Γιώργος Ιωάννου», εφαρμόζοντας την ολοκληρωμένη μάθηση γλώσσας και περιεχόμενου (CLIL), την ομαδοσυνεργατική και τη διαφοροποιημένη μάθηση.

Την 1^η διδακτική ώρα, οι μαθητές/τριες χωρίζονται σε 4 ομάδες και παίρνουν ένα φύλλο εργασίας με διαφορετικό σχήμα, και αντίστοιχο καρτελάκι. Παρακολουθούν ένα διαδραστικό βίντεο και η κάθε ομάδα γράφει τις απαντήσεις στο φύλλο εργασίας.

Στη συνέχεια, διαβάζουν ένα κείμενο από τη Britannica για τον αριθμό π , κάνουν μία δραστηριότητα κατανόησης κλειστού τύπου, αντίστοιχης της τράπεζας θεμάτων του μαθήματος αγγλικής γλώσσας, και μία δραστηριότητα λεξιλογίου (να βρουν τις λέξεις από το κείμενο που αντιστοιχούν στους ορισμούς που δίνονται, βασισμένοι στα συμφραζόμενα).

Στο τέλος, παίζουν το παιχνίδι του κύβου, έχοντας 2 ευκαιρίες, και καλούνται να απαντήσουν σε μία ερώτηση, που βασίζεται στην ταξινόμια του Bloom. Αποτελεί δραστηριότητα διαφοροποιημένης μάθησης γιατί οι ερωτήσεις είναι διαβαθμισμένες (χαμηλής και υψηλής τάξης).

Τη 2^η διδακτική ώρα, δίνονται στις ομάδες των μαθητών κύκλοι και σκοινί και καλούνται να υπολογίσουν το μήκος της ακτίνας ρ , το μήκος L κάθε κύκλου και το πηλίκο του μήκους του κύκλου προς την αντίστοιχη διάμετρο δ .

Στη συνέχεια, οι μαθητές/τριες μεταβαίνουν στη σελίδα <https://photodentro.edu.gr/v/item/ds/8521/5682> του Φωτόδενδρου και στη Δραστηριότητα 1, διαβάζουν τις οδηγίες και κάνουν υπολογισμούς για να επιβεβαιώσουν τα αποτελέσματα με βάση το λογισμικό (Οι ομάδες 1 και 2 να ασχολούνται με τα εγγεγραμμένα πολύγωνα και οι ομάδες 3 και 4 με τα περιγεγραμμένα πολύγωνα).

Τέλος, αφού αποκωδικοποιήσουν ένα μήνυμα για τα πρώτα ψηφία του π , γράφουν τη δική τους εκδοχή σε όποια γλώσσα θέλουν για να απομνημονεύεται εύκολα ο αριθμός π .



A. Watch the following video, work in groups and write down the answers to the video questions.

<https://edpuzzle.com/media/65c138a7ed7856d5499f1c4b>

B. Read the following text and answer the questions that follow (in groups).

Pi, in mathematics, the ratio of the circumference of a circle to its diameter. The symbol π was devised by British mathematician William Jones in 1706 to represent the ratio and was later popularized by Swiss mathematician Leonhard Euler. Because pi is irrational (not equal to the ratio of any two whole numbers), its digits do not repeat, and an approximation such as 3.14 or $\frac{22}{7}$ is often used for everyday calculations. To 39 decimal places, pi is 3.141592653589793238462643383279502884197.

The Babylonians (c. 2000 BCE) used 3.125 to approximate pi, a value they obtained by calculating the perimeter of a hexagon inscribed within a circle and assuming that the ratio of the hexagon's perimeter to the circle's circumference was $\frac{24}{25}$. The Rhind papyrus (c. 1650 BCE) indicates that ancient Egyptians used a value of $\frac{256}{81}$ or about 3.16045. Archimedes (c. 250 BCE) took a major step forward by devising a method to obtain pi to any desired accuracy, given enough patience. By inscribing and circumscribing regular polygons about a circle to obtain upper and lower bounds, he obtained $\frac{223}{71} < \pi < \frac{22}{7}$, or an average value of about 3.1418. Archimedes also proved that the ratio of the area of a circle to the square of its radius is the same constant.

Over the ensuing centuries, Chinese, Indian, and Arab mathematicians extended the number of decimal places known through tedious calculations, rather than improvements on Archimedes' method. By the end of the 17th century, however, new methods of mathematical analysis in Europe provided improved

ways of calculating pi involving infinite series. For example, Isaac Newton used his binomial theorem to calculate 16 decimal places quickly. Early in the 20th century the Indian mathematician Srinivasa Ramanujan developed exceptionally efficient ways of calculating pi that were later incorporated into computer algorithms. In the early 21st century computers calculated pi to 62,831,853,071,796 decimal places, as well as its two-quadrillionth digit when expressed in binary (0).

Pi occurs in various mathematical problems involving the lengths of arcs or other curves, the areas of ellipses, sectors, and other curved surfaces, and the volumes of many solids. It is also used in various formulas of physics and engineering to describe such periodic phenomena as the motion of pendulums, the vibration of strings, and alternating electric currents.

<https://www.britannica.com/science/pi-mathematics>

QUESTIONS	TRUE	FALSE	NOT MENTIONED
1 The number pi was made popular by the mathematician William Jones.			
2 A different version of pi is used in different calculations.			
3 In equations, 39 decimals of pi are used.			
4 The Babylonians calculated the value of pi by using a square.			
5 The more approximate value of pi was given by Archimedes..			
6 The Japanese further improved Archimedes' method.			
7 Isaac Newton calculated more decimal places than Archimedes.			
8 Pi is not included in computer algorithms.			
9 Problems with curves surfaces involve the number pi.			
10 Pi is only related to mathematical problems			

Find the words in the above text that mean the following.

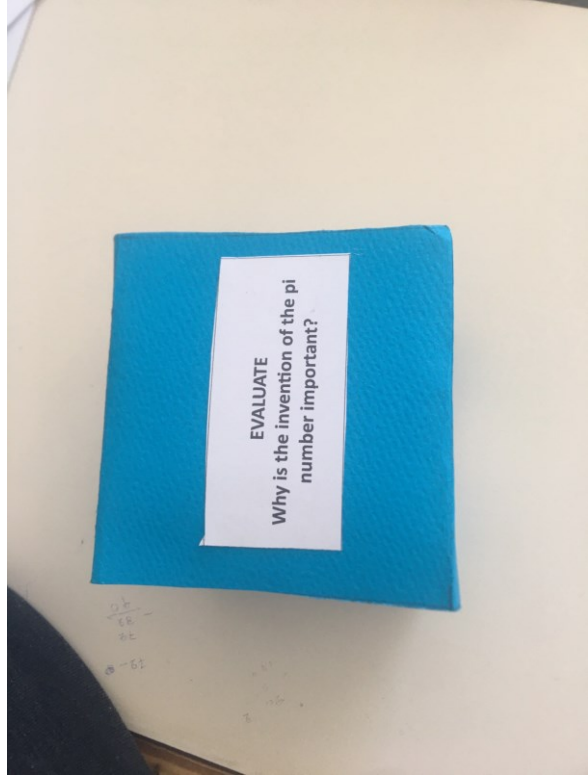
1	the line surrounding a circular space, or the length of this line	
2	relating to or expressed in a system of counting based on the number ten	
3	the relationship between two groups or amounts that expresses how much bigger one is than the other	

4	a number that cannot be expressed as the ratio of two whole numbers	
5	(the length of) a straight line joining the centre of a circle to its edge or the centre of a sphere to its surface	
6	an expression (= a mathematical statement) that has two terms (= numbers or symbols) that are not the same	
7	relating to 2-digit system	
8	the shape of part of a circle, or other curved line	
9	a line that bends continuously and has no straight parts	
10	A device consisting of a weight on a stick or thread that moves from one side to the other	

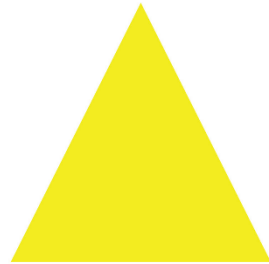
C. Play the Cube Game in groups and answer the Qs.

CUBE Qs (Bloom's taxonomy)

REMEMBER Who invented the pi number?	ANALYZE Analyze Archimedes' method of calculating the pi number.
UNDERSTAND Why is pi an irrational number?	EVALUATE Why is the invention of the pi number important?
APPLY Mention some applications of the pi number.	CREATE What is the circumference of a circle if the radius is 3 meters?



WORKSHEET 1



WORKSHEET 2



WORKSHEET 3



WORKSHEET 4



ACTIVITY 1

Measure the radius ρ and length L of each circle. Then calculate the quotient of the length of the circle to the corresponding diameter δ .

Circle (a)

$\rho =$

$L =$

$\frac{L}{\delta} =$

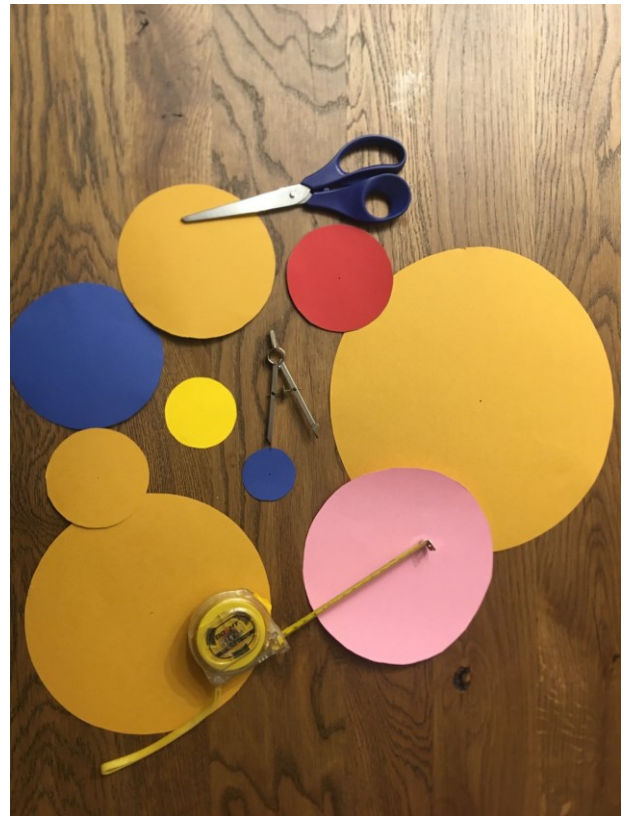
Circle (b)

$\rho =$

$L =$

$\frac{L}{\delta} =$

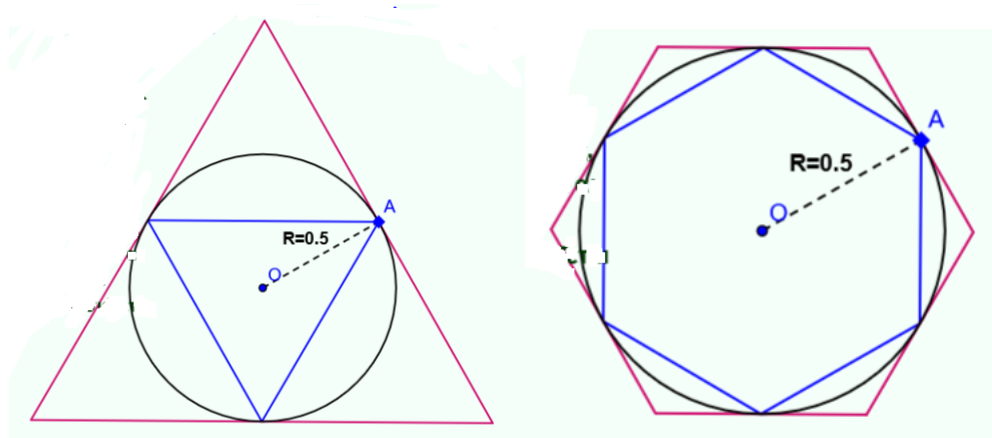
What do you notice?



ACTIVITY 2

Visit website <https://photodentro.edu.gr/v/item/ds/8521/5682> and in **Activity 1**. Read the instructions carefully and do the appropriate calculations to confirm the results based on the software.

Groups 1 and 2 deal with inscribed polygons and groups 3 and 4 with circumscribed polygons.



a) $P_3 =$ $P'_3 =$

$P_6 =$ $P'_6 =$

What do you notice?

b) What shape do the two polygons tend to identify with?

c) What relation connects P_v, P'_v, L for each v ;

ACTIVITY 3

What message do the first digits of p hide?

In the Greek language, according to Nikolaos Hadzidakis, it could be:

«Αεί (3) ο (1) Θεός (4) ο (1) μέγας (5) γεωμετρεί (9)

το (2) κύκλου (6) μήκος (5) ίνα (3) ορίση (5) διαμέτρω (8)

παρήγαγεν (9) αριθμόν (7) απέραντον (9)

και (3) όν (2) φεύ! (3) ουδέποτε (8) όλον (4) θνητοί (6) θα (2) εύρωσι (6)»

There are several versions in the English language. For example:

May I have a large container of coffee?

3. 1 4 1 5 9 2 6



$$\pi = 3.1415926$$

$$\text{Area} = \pi r^2$$

$$\text{Circumference} = \pi d$$

Write your own version for the pi number in any language you like....

