The Sine of Music

for language learning - 9-10 November 2017, Florence (Italy)

Unravelling the mystery of music: presentare le funzioni circolari ...'istituto tecnico in modalità CLIL

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ITI - Enrico M...
San Giorgio a Cremano (

Plan of the talk

Why

Context

Planning

Realization

Results and Conclusion

Why

uropean Indications

Council Resolution of 31 March 1995 on improving and diversifying language learning and teaching within the education systems of the European Union . (95/C 207/01)

Comunicazione della Commissione al Consiglio, al Parlamento europeo, al Comitato economico e sociale e al Comitato delle regioni – Promuovere l'apprendimento delle lingue e la diversità linguistica: Piano d'azione 2004 –2006

Council Resolution of 21 November 2008 on a European strategy for multilinguismo. (2008/C 320/01)

Why

lian Regulations

orma Gelmini

D.PP.RR. N. 88 del 2010 Regolamento recante norme per il riordino d
tituti tecnici "l'insegnamento, in lingua inglese, di una disciplina non linguistica compresa nell'a
rizzo del quinto anno, da attivare in ogni caso nei limiti degli organici determinati a legislazione vigente".

irettiva n. 4 del 2012 – Linee guida per gli Istituti Tecnici
si tratta, semplicemente, dell'insegnamento di una disciplina 'in inglese' o di una varietà della glottodidattic
a materiale linguistico settoriale. Il CLIL si concretizza in un "laboratorio cognitivo" di saperi e procedur
tengono ai due ambiti disciplinari e si sviluppa in un percorso contestualizzato all'indirizzo di studio per integr
e parti del curricolo, migliorare la motivazione e attivare competenze progettuali, collaborative e coopera
tarlo verso una dimensione professionale".

Context

Training course @ my school-
stituto Tecnico Industriale

Planning and realization of a
0-hours module

her competences in CLIL
the subject
uistic
thodological

. . . nota Miur 4969 del 25 luglio 2014

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Context

CLIL

s ...

                              It is not...

a methodology	A technical module in a foreign langu
learner-centered	Just a typical lesson in English
es a authentic material	Exercises and notes in a different lang
omotes *scaffolding*	It does not reduce the content
ses tools that are commonly used in uage learning	It's not just the translation of what the student already knows
—> CALP	
ramework(Content, Communication, nition, Culture)	

4Cs Framework

Language Tryptich

Coyle D. 2005
DevelopingCLII
TowardsaTheory
Practice, Barce
APAC

Communication

CLIL

Content

Culture

Cognition

Do Coyle

ect content
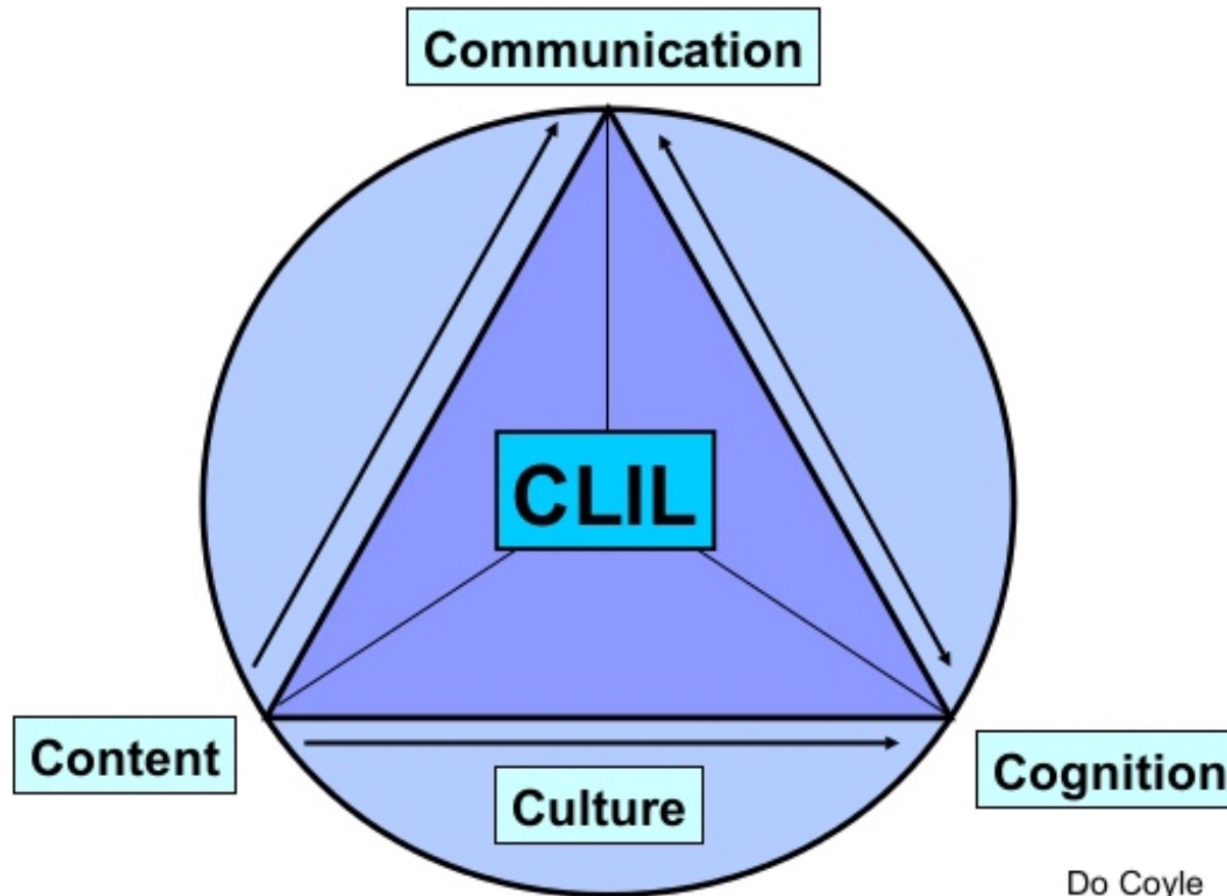
Learning
LOTS & HO

Cotizenship

Language Tryptich

Coyle D. et al.
`CLIL,Conte`
`Language`
`Integrated`
`Learning`
Cambridge Un
Press: Cambri

Language <u>of</u> learning

Foreign Language learning

Language <u>for</u> learning   **Language <u>through</u> learning**
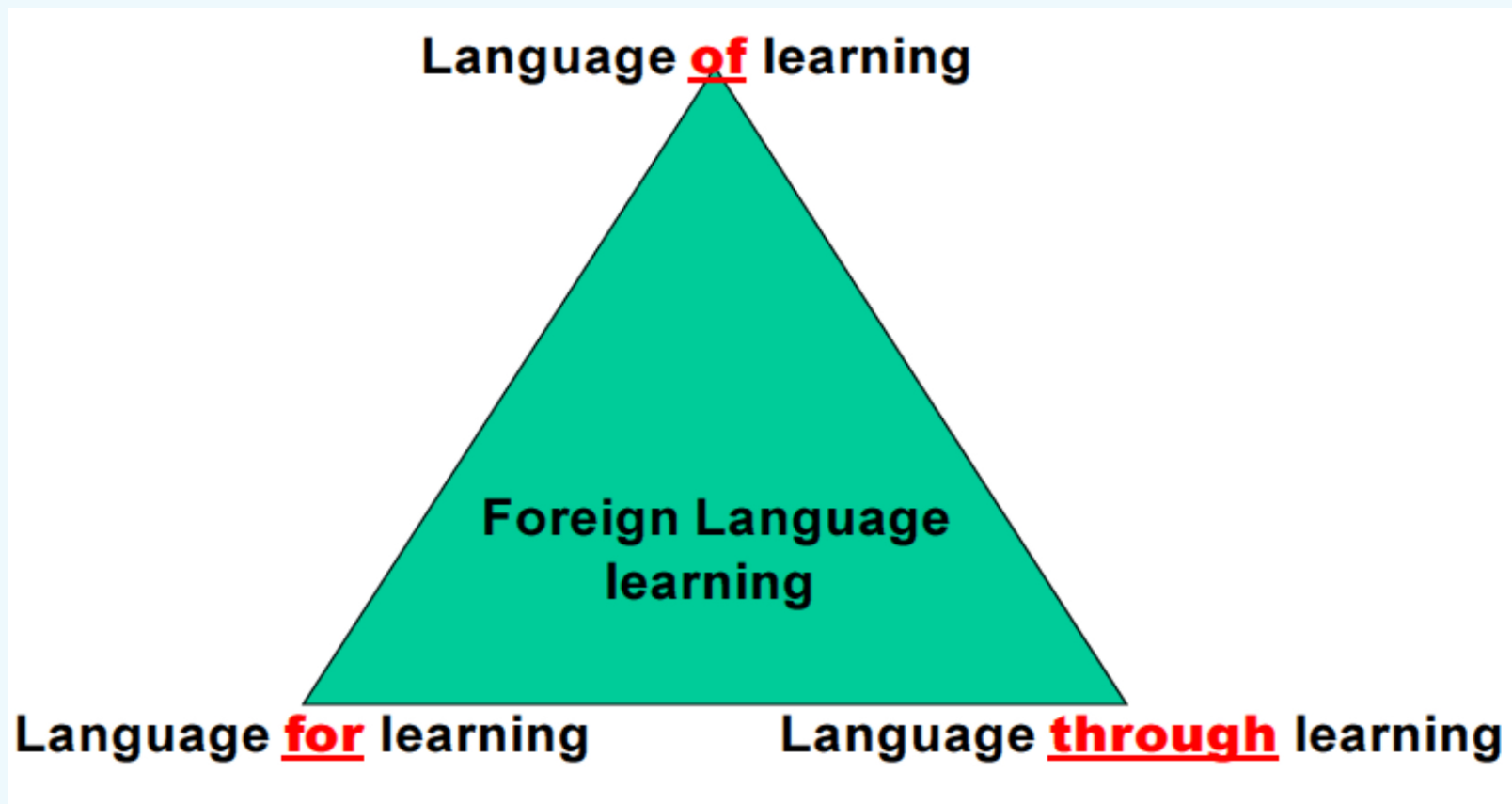
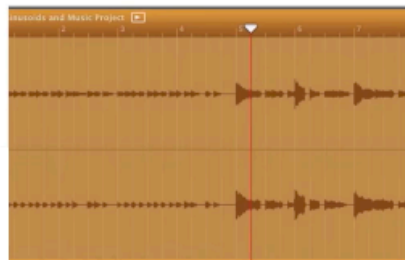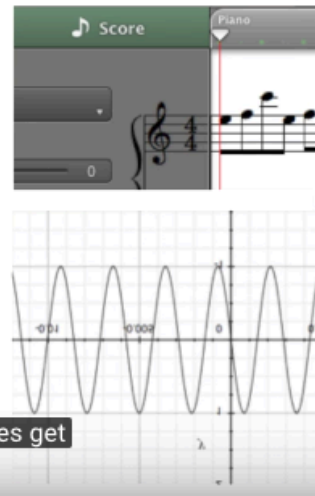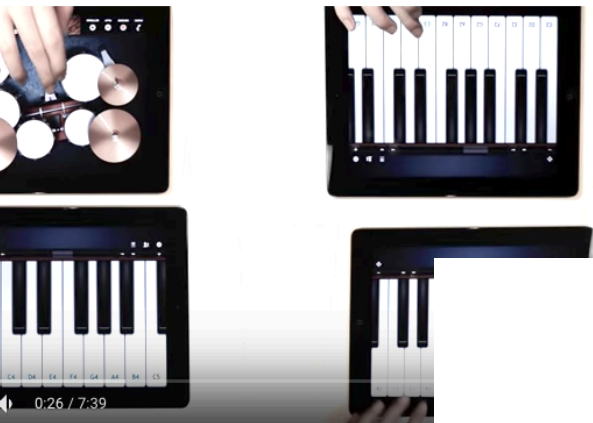| Trigonometric functions and sound waves			
Lesson	Time	Topic	Teacher
1	2 hours	Trigonometric function and music: video from Khan + comprehension activities The sine of music	Maths
2	2 hours	From trigonometry in right triangles to the Unit Circle definition. Production, practice. Video from Khan Unit Circle Definitions	Maths
3	2 hours	Flipped lesson about graphing sine, cosine and tangent functions.	Maths
4	1 hour	Listening and practice activities about properties of sinusoids from graphs. (period, amplitude, frequency, midline, phase shift) Video from Khan: Midline-Amplitude-Period	Maths
5	1 hour	Flipped lesson about determining properties of trigonometric functions from equation. Reading and practice activities.	Maths
6	2 hours	Final test and assessment	Maths

...ime	Type of Activity	Description of activity	Grouping	Material/Tools
..0-15 ..mins	Warm up: contextualising	The students discuss on the relation between music and mathematics. They will make a list of the math tools needed to play music and to listen to it. They will write the list in their exercise books and then share it with the whole class.	group	Students' exercise books
..0-15 ..mins	Pre-watching : focusing on the meaning of common-use terms	The students will discuss on the mathematical formulation of music by answering questions	Pairwork	Worksheet 1
..25-30 ..mins	While-watching/listening	• Before listening/reading, they will read the text with blanks to make predictions about the missing words (in a text on the mathematical representation of sound) • Then the students will watch at the video and fill the blanks	Pairwork	worksheet 1 (the students will read the written text and watch at it on youtube)
..5 mins	Post-reading/listening	The students will answer true/false questions on text on the mathematical representation of sound and correct the false ones.	Pairwork	Worksheet 1
..mins	Production: information gap activity	In pairs, students are given words or definitions and should correctly associate all of them by asking the other student the missing information.	Pairwork	Worksheet 1
..mins	K-W-L activity	The students fill in a K-W-L chart by brainstorming their ideas on the Unit they are going to study.	group	Worksheet 1
..mins	Assigning homework	At home, the students will watch at a video. Moreover the students are asked to practice with trigonometric ratio in right triangles. The material is shared with Classroom (Flipped lesson to recall and strengthen the requirements)	solo work	Khan Academy Soh-Cah-Toa

- Authentic materi...
- Typical tools of English teaching
- Accuracy in time... and content planning
- Tutoring and gro... activities
- Scaffolding

The sine of music

https://www.youtube.com/watch?v=Uucab_r9BRs
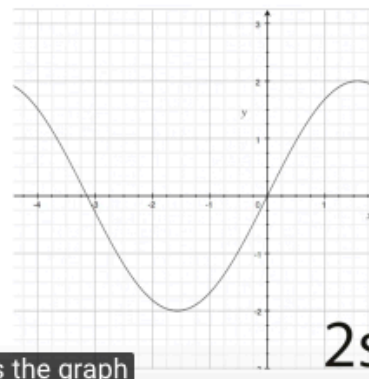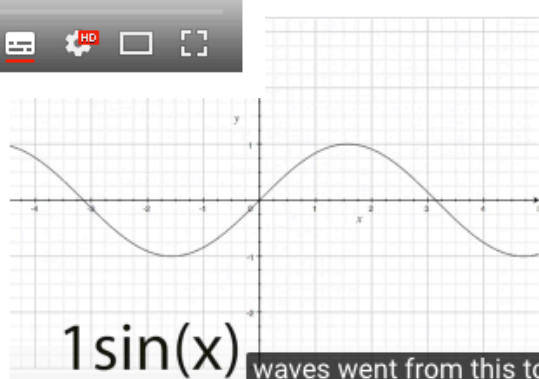
melody and it's score the notes get higher from E to F

$f(x) = asin(x)$

$1\sin(x)$

waves went from this to this the graph experience is an increase in amplitude

hat you just heard can be explained sing matts the sinusoidal

ICT4ALL, 9-10 Novem

Tools and material

PRE-WATCHING ACTIVITY

Discuss in pairs the following questions and write down the answers in your exercise

1. What is the function that represents a sound wave?
2. Could you describe what is the sound amplitude?

WATCHING ACTIVITY

blanks according to the information in the video. You can choose among the following
ords.

| Intersects | phase shift | taller | shorter | reciprocal | ratio |
| period | sinusoid | absolute value | frequency | noise | pitch | oscillates |

usoidal function is a function whose graph (1)………………infinitely and can be
ed as a sine function.

made up of sound waves and these

POST-WATCHING ACTIVITY

**In pairs, answer true/false questions and correct the false ones. Copy the correct senten
your exercise book.**

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Strumenti caratteristici

student A read first list and ask student B to associate a definition to each term.
dent B does the same with second list. Both write down the definition in their
books.

K-W-L Chart

KNOWN	WANT-to-KNOW	LEARNED

A:

ave:

e:

B:

nusoidal function is a function whose graph oscillates infinitely and can
ressed as a sine function. Music is made up of sound waves and
sound waves are sinusoidal functions. Let's watch the tune and look at
und waves that are created by the music. The graph of the sound
becomes taller every time a chord is played. What the graph
ence is an increase in amplitude. Graphically, amplitude 'A' is half the
of the wave. So if you increase the value of 'A', the wave gets taller;
called a vertical stretch. If you decrease the value of 'a', the wave gets
r; this is called a vertical shrink. When talking about music amplitude
ents volume. The louder the music is the greater the amplitude and the
he sound waves.

USEFUL EXPRESSIONS

These are some useful expressions we are using during this activity. If necessary, look
meaning and write down in your exercise book. You will need it!

Music	Maths
Note	Sinusoidal function
Chord	Graph
Sound wave	Absolute value
Amplitude	Amplitude
Frequency	Frequency
Pitch	Period
Volume	Zero of a function
Consonant	Intersection
Octave	Phase

ADING ACTIVITY:

text below and reproduce the picture in your exercise book. Choose a letter for each
ntioned in the text and rewrite the sine, cosine and tangent definition in terms of the
a segment.

## What is the unit circle definition of the trigonometric functions?

t circle definition allows us to extend the domain of sine and cosine **eal numbers**. The process for determining the sine/cosine of any is as follows:

from $(1,0)$, move along the unit circle until the angle that is formed your position, the origin, and the positive x-axis is equal to θ.

is equal to the y-coordinate of your point

is equal to the x-coordinate.

is equal to the y-coordinate of the i to

le in point A (a line that touches th id ntering the circle's interior) and the slo

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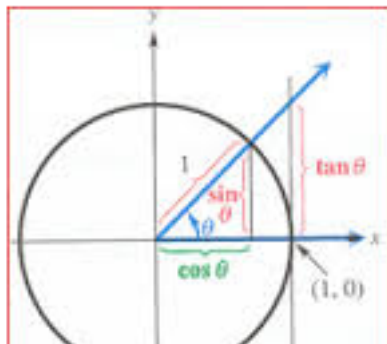
Properties of trigonometric functions derived from equations

PRE-READING ACTIVITY/PRACTICE

In pairs, read and correct the following sentences. After the correc copy the correct version of the sentences in your exercise book.

1. The amplitude of a periodic function is just the difference betweer minimum and the maximum value it takes on.
2. The amplitude of $y = -\frac{1}{2} \cos(3x)$ is $-\frac{1}{2}$.
3. Given a generic sinusoid function, the amplitude is the absolute val the argument of the function.
4. The period of a cyclic function refers to the length of the largest int that contains exactly one copy of that cyclic function.
5. The period represents a length on y-axis.
6. The period P of $y = -\frac{1}{2}\cos(3x)$ is P= π/3.
7. The period coefficient
   4. The phase shift is equal to –c/b.
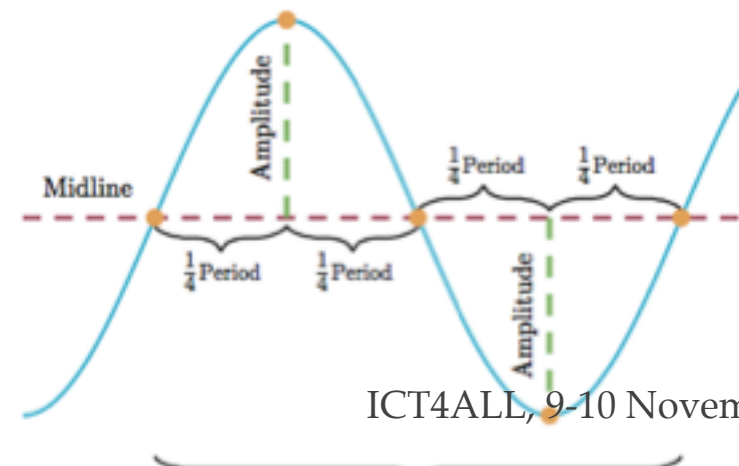
Final assessment

Check ✓ 1. Complete this statement: Graphs of sine and cosine functions are called ? .
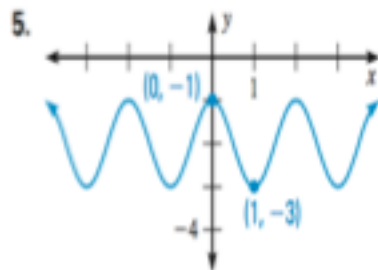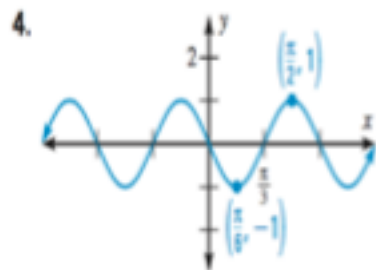
Check ✓ 2. Which two points are most useful when writing a sinusoidal model for a given graph or set of data? Explain.

3. Describe a characteristic of a sinusoidal graph that you would model with a cosine function rather than a sine function.

Check ✓ Write a function for the sinusoid.

4.

5.

Write a function for the sinusoid with maximum at A and minimum at B.
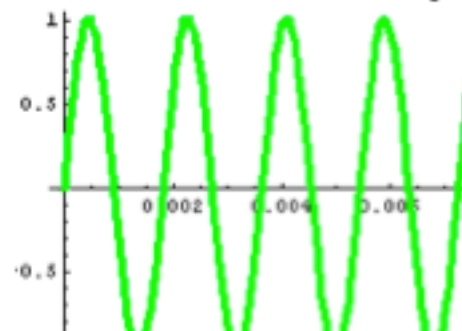
6. $A(0, 8)$, $B(\pi, -2)$ 7. $A(\pi, 10)$, $B(3\pi, 4)$ 8. $A(6, 5)$, $B(2, 1)$
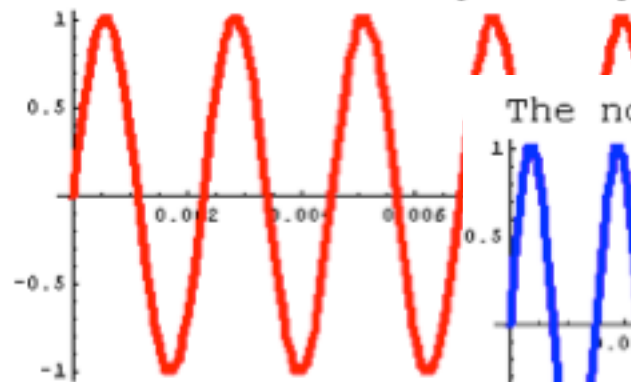
9. Here are the graphs of three music notes.
For each, determine
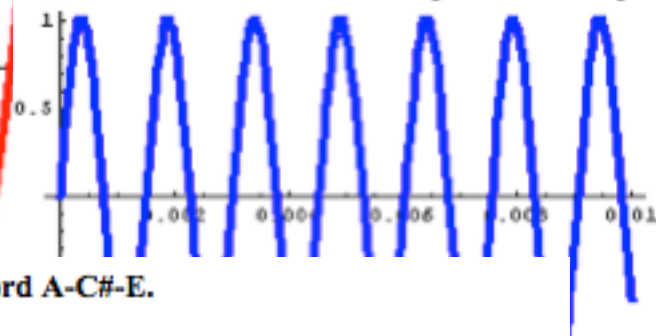   a. Amplitude;
   b. Frequency;
   c. Period;

The note C#: Sin[1

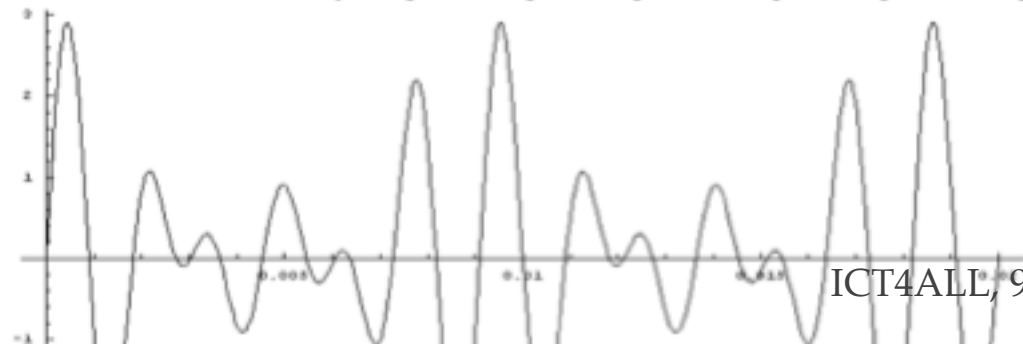The note A: Sin[880 π x]

The note E: Sin[1320 π x]

10. Finally, here is the graph of the chord A-C#-E.

10.a Is it a sinusoid?
10.b Is it a periodic function?
10.c What is the period (suppose that on the x-axis time in seconds is represented) ?

The chord A-C#-E: (Sin[880 π x] + Sin[1100 π x] + Sin[1320 π x])

Results and conclusions

trong motivation

Good results both for their realization and in the final ssessment

uspicion by the best students

t would be necessary an accurate time-scheduling

t would be more collaboration with language olleagues