

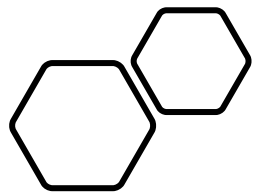


Vedrana Mikulić Crnković  
([vmikulic@math.uniri.hr](mailto:vmikulic@math.uniri.hr))

Odjel za matematiku  
Sveučilište u Rijeci

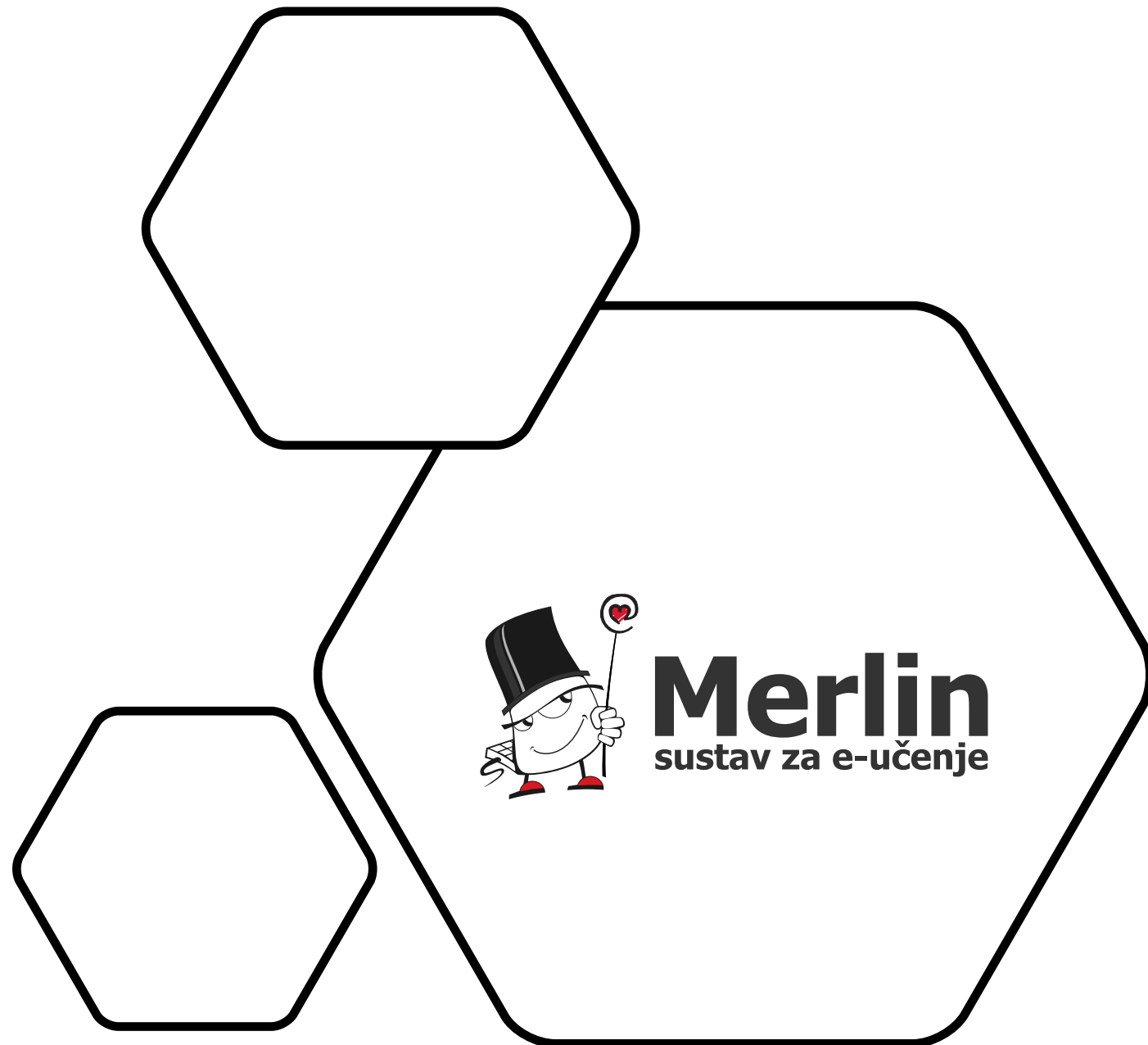
# Virtualna matematika

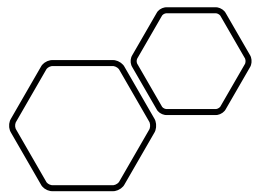
18. veljače 2021.



## Prije 2020

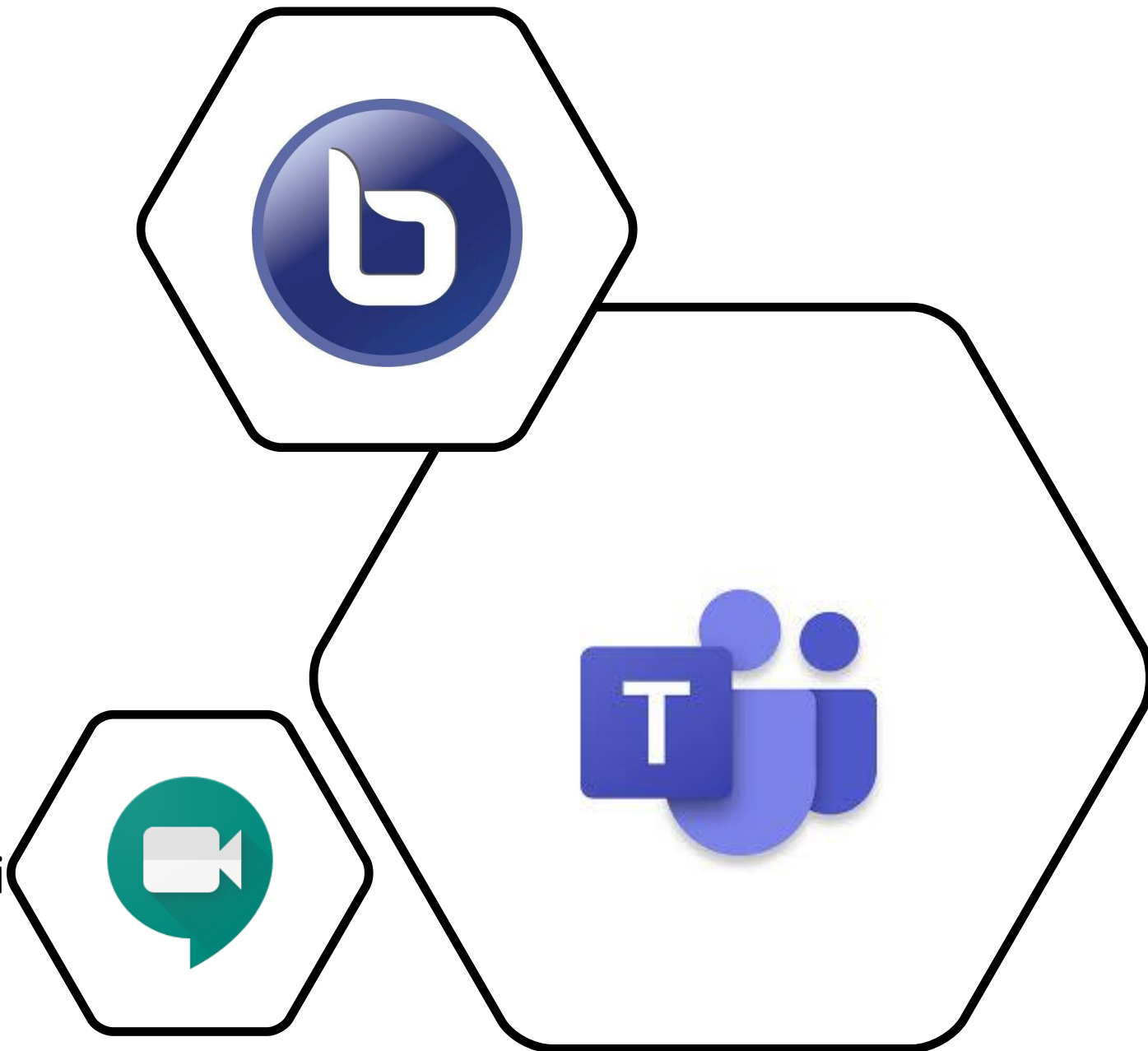
- moodle kao podrška F2F nastavi
- komunikacija, nastavni materijali, zadaće, testovi, različite vrste pitanja....
- poučavanje budućih nastavnika matematike kako koristiti moodle i ostale digitalne alate u nastavi matematike





2020

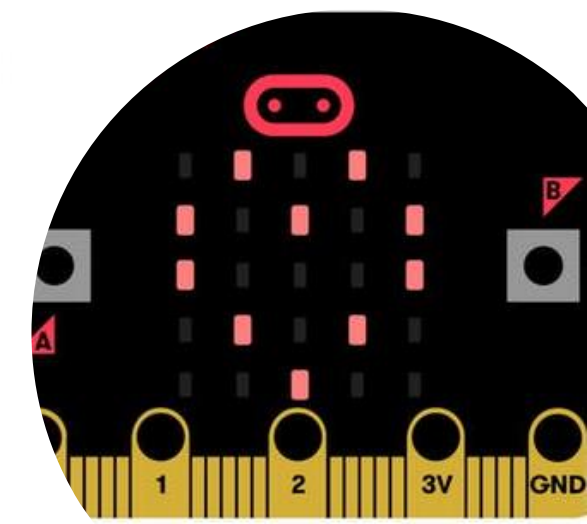
- Novi alati: Microsoft Teams, BigBlueButton, Google Meet, pametne olovke, ...
- Novine u radu: poučavanje matematike online, konzultacije online, poučavanje rada u GeoGebri online, studentski seminari online, studentski projekti online, vrednovanje online



# Prilika:

poučavanje studenata na kolegiju  
Primjena računala u matematici

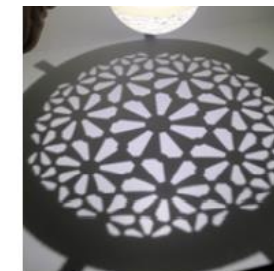
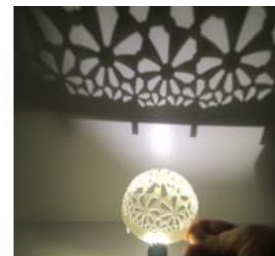
- analiza dostupnih digitalnih materijala
- priprema i održavanje sinhronone online nastave
- vođenje učenika u online okruženju



# Prilika:

poučavanje studenata na kolegiju  
Modeli geometrije

- obrnuta učionica
- istraživačke aktivnosti u programu Cinderella
- samostalno rješavanje zadataka kao priprema za kolokvij

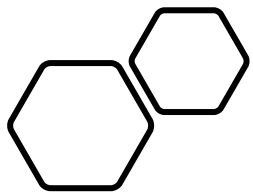


Slika 21: (7,3,2)

Zbroj veličina kutova u trokutu u euklidskoj, sfernoj i hiperboličkoj ravninskoj geometriji možemo provjeriti i na našim primjerima popločavanja.

1. (6,3,2) popločavanje trokutima postoji jedino u euklidskoj ravnini i to je popločavanje sukladnim trokutima čije veličine kutova su  $180^\circ/6$ ,  $180^\circ/3$  i  $180^\circ/2$ , tj. vidimo da je zbroj veličina kutova u trokutu  $180^\circ$ .
2. (5,3,2) popločavanje trokutima postoji jedino u sfernoj ravnini i to je popločavanje sfernim trokutima čije veličine kutova su  $180^\circ/5$ ,  $180^\circ/3$  i  $180^\circ/2$ , tj. vidimo da je zbroj veličina kutova u trokutu  $180^\circ \cdot 31/30$  (veći od  $180^\circ$ ).
3. (7,3,2) popločavanje trokutima postoji jedino u hiperboličkoj ravnini i to je popločavanje trokutima hiperboličke ravnine čije veličine kutova su  $180^\circ/7$ ,  $180^\circ/3$  i  $180^\circ/2$ , tj. vidimo da je zbroj veličina kutova u trokutu  $180^\circ \cdot 41/42$  (manji od  $180^\circ$ ).

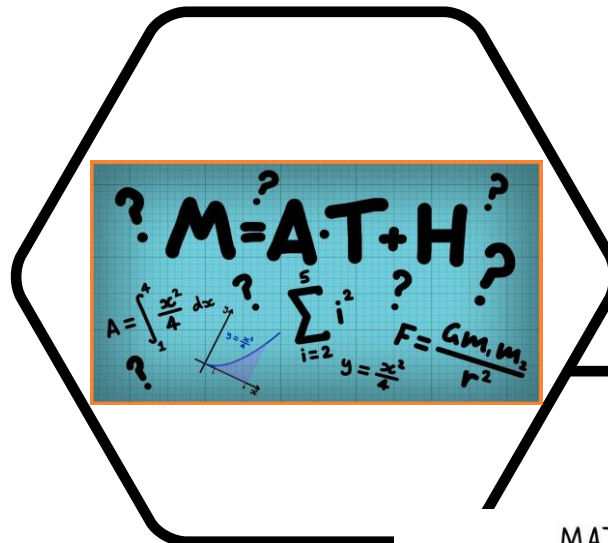
**9. zadatak:** Nacrtajte, u programu Cinderella, trokute opisane u gore navednim slučajevima. Preciznije, pokušajte popločite dio euklidske ravnine (6,3,2) popločavanjem, dio sferne ravnine (5,3,2) popločavanjem i dio hiperboličke ravnine (7,3,2) popločavanjem (pokušajte nacrtati kuteve čije su mjere što bliže zadanim vrijednostima, ).



Prilika:

izborni kolegij Computer-based  
Math za YUFE studente  
(u potpunosti online kolegij)

program cjeloživotnog  
obrazovanja Computer-Based  
Math (onsite i online)



**MATH IS EVERYWHERE!** WSKG

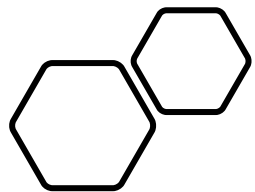
Use what's around your busy family to support learning—Wherever you are!  
Start with these questions:

**WAITING IN LINE**

- What buttons do you touch to make 56?
- Where is aisle 4?
- Which candy is shaped like a cylinder?
- What candy is BELOW the lollipop?
- Can you find the 3 on my watch?  
What number comes before 7?

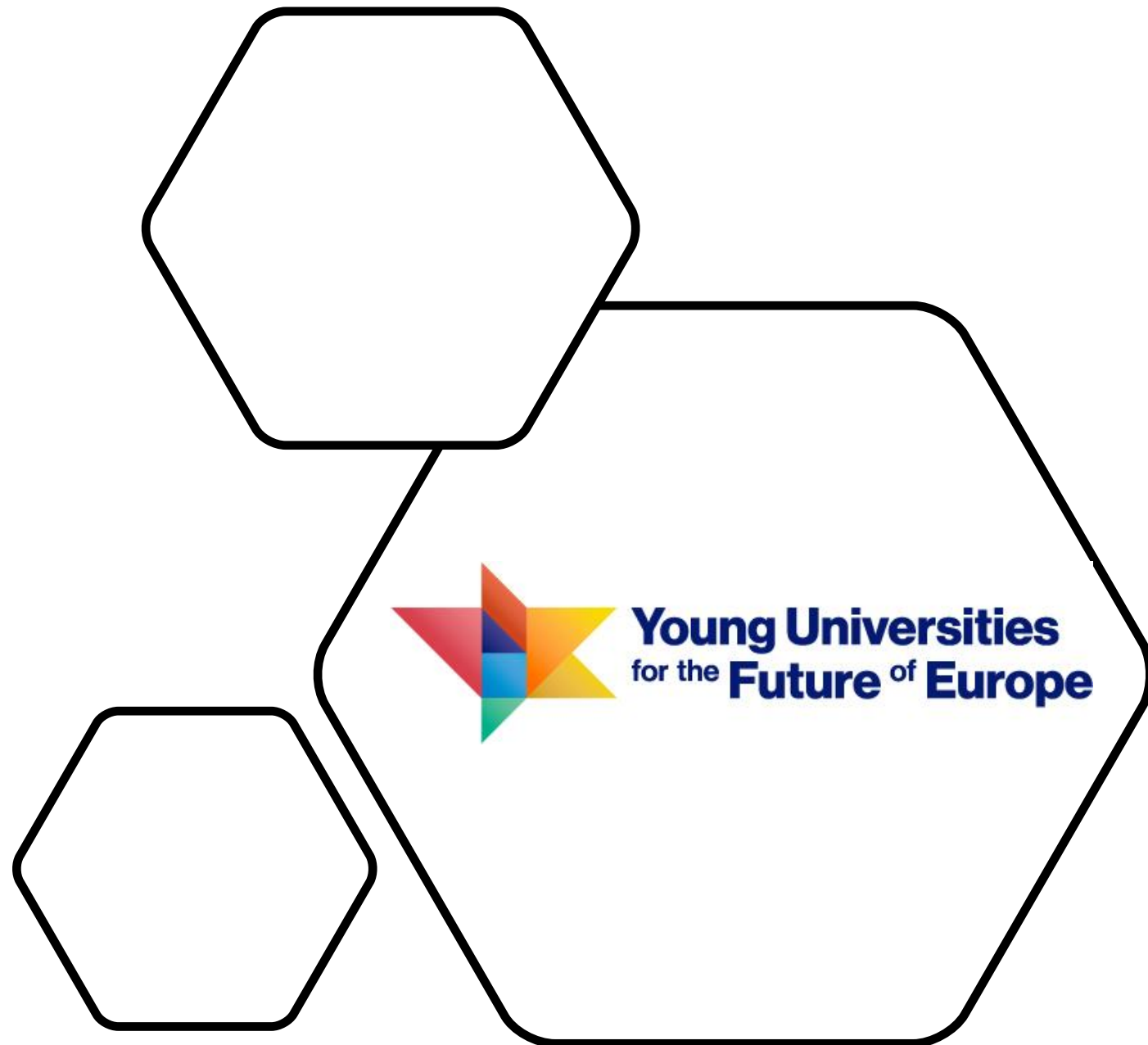
**COOKING DINNER**

- Do you know how many carrots are in this group?
- Can you count the teaspoons as I pour the oil?
- How many forks do we need on the table for everyone to eat?
- Can you make a pattern with forks, knives, and spoons?



- University of Bremen, Nicolaus Copernicus University in Torun, Maastricht University, University of Cyprus, Universidad Carlos III de Madrid, University of Eastern Finland

- fotonika, umjetna inteligencija, zrakoplovno inženjerstvo, biomedicina, računarstvo, lingvistika,....





# Online kolegij

The screenshot shows the Merlin e-learning system interface. At the top left is the Merlin logo with the text 'Merlin sustav za e-učenje' and the years '2019' and '2020'. At the top right is the 'srce' logo with the text 'Sveučilište u Zagrebu Sveučilišni računski centar'. Below the logos is a navigation bar with 'Work on the system', 'Helpdesk', 'My courses', and 'Content'. A search bar and a user profile for 'Vedrana Mikulić Crnković' are also present. A breadcrumb trail shows the path: 'Dashboard > My courses > Drugi obrazovni programi > Sveučilište u Rijeci > Odjel za matematiku > Computer-Based Math'. The main content area is titled 'Computer-Based Math' and contains a welcome message to YUFE students, stating that this is their first online course and asking for feedback. Below the message is a forum post titled 'Tell us something about yourself'. At the bottom, there is a section with 'Open all' and 'Close all' buttons, followed by five expandable topics: 'Communication on the course - Toggle', 'About the course Computer-Based Math - Toggle', 'Python - Toggle', 'Math Lectures - Toggle', and 'Problems - Toggle'. Each topic has a play button icon on the left and a 'Topic' label with a number on the right.

Merlin sustav za e-učenje / 2019 / 2020

srce  
Sveučilište u Zagrebu  
Sveučilišni računski centar

Work on the system Helpdesk My courses Content

Vedrana Mikulić Crnković

Dashboard My courses Drugi obrazovni programi Sveučilište u Rijeci Odjel za matematiku Computer-Based Math

## Computer-Based Math

Dear YUFE students,  
we are extremely pleased that you have enrolled in the elective course Computer-based Math. We hope to meet your expectations and justify your trust.  
This is our first online course and we are designing and preparing it just for you. Please understand if there are any errors and please let us know if you notice any.

We are both mathematicians and most of our students so far were students of mathematics, computer science, or engineering.

Please write to us something about yourself within the following forum.

Tell us something about yourself

► Open all ▼ Close all

Instructions: Clicking on the section name will show / hide the section.

- Communication on the course - Toggle Topic 1
- About the course Computer-Based Math - Toggle Topic 2
- Python - Toggle Topic 3
- Math Lectures - Toggle Topic 4
- Problems - Toggle Topic 5



# 1. dio: Lekcija Learn Python

Lekcija je temeljena na tutorialima dostupnim na python.org i ostalim službenim izvorima te sadrži:

- 13 cjelina,
- 55 primjera s rješenjima,
- 17 pitanja (za napredovanje),
- samostalnu aktivnost koja se ocjenjuje te je dostupna tek po završetku lekcije.

3

Python - Toggle

 Learn Python

If this is your first time using Python, you should slowly go through this lesson.

If you have programmed in Python before, use this lesson to recall and upgrade your knowledge.

Good luck!

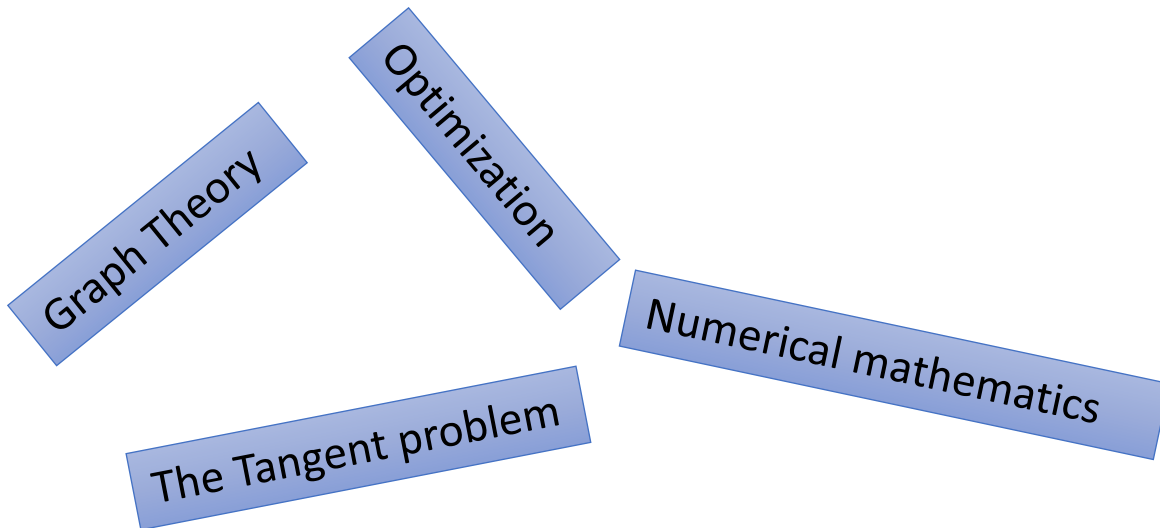
 Homework generator

 Homework submission

## 2. dio: Math Lecture

Drugi dio je dostupna od točno određenog datuma za sve studente koji su na samostalnoj aktivnosti iz Pythona imali barem 50 % bodova.

Snimili smo 9 kratkih predavanja te pripremili dodatne materijale i kviz.



4 ▼ Math Lectures - Toggle

Mathematics gives us a universal language by which we can describe the world around us.


By translating the problem we are solving into mathematical language, that is, by creating a mathematical model of the problem we are solving, we come to the position that the entire field of mathematics actually works in our favor and helps us find and discuss the solution to the problem.

GRAPH THEORY

The image shows a video player interface. The video title is "Theory sa strajem - Spremljeno". The player has a play button in the center. The interface includes a progress bar, volume control, and other standard video player controls. The video content is partially visible at the bottom, showing a blue and green arc.

# 3. dio: Computer-Based Math

Ovaj dio kolegija je ponovo bio dostupan od određenog datuma za sve studente koji su uspješno riješili zadatke za samostalnu aktivnost i kviz.


5  Problems - Toggle

The problem-solving process is carried out through 4 steps:

1. Description of the problem and definition of questions that need to be answered
2. Mathematical model of the problem and precise description of the restriction of the model
3. Solving the problem by using a computer
4. Analysis of the obtained solution in relation to the initial problem (step 1) and model restrictions (step 3)

Job distribution problem (`maxflow.py`, `maxFlowInputData.py`)  
The scheduling problem (`graphColoring.py`, `graphColoringInputData.py`)  
Echo location of a target (`echoLocationSystemFinal.py`)

**Restricted** Not available unless: You achieve a required score in **Math quiz**

 Echo location of a target (video explanation)

**Restricted** Not available unless: You achieve a required score in **Math quiz**

Building heating system (`BuildingHeatingSystem.py`)

**Restricted** Not available unless: You achieve a required score in **Math quiz**

Lake volume management (`FreshLakeSimple.py`)

**Restricted** Not available unless: You achieve a required score in **Math quiz**

## 4. dio: Studentski projekti

- Širenje virusa
- Post-kvantna kriptografija
- Volumen vode u jezeru i napajanje
- Problem presretanja asteroida u Sunčevom sustavu
- ....



# Popularizacija matematike i znanosti općenito

- Festival znanosti (Otvoreni dan, Tetragon),
- 50- tak matematičkih aktivnosti godišnje,
- interaktivna i zabavna matematika,
- brojni projekti i suradnje,
- ...

**Math is**

*$f(u)^n$*



Matematika u vrtićima, matematika u muzejima...  
matematičke igraonice i likovne radionice



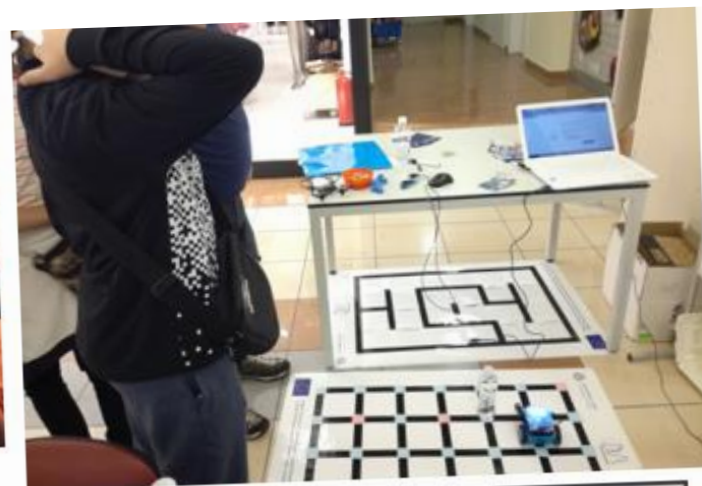


u suradnji s institutom  
Mathematisches  
Forschungsinstitut  
Oberwolfach

Imaginary -  
čarobna  
matematika

od 2016. godine





Matematička potraga za  
blagoma

---



Imaginary - čarobne  
matematičke projekcije

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# Math Escape

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# Prilika:

popularizacija znanosti online

- Festival znanosti Rijeka

<https://festivalznanosti.uniri.hr>

- Imaginary – virtualna šetnja

<https://360.goterest.com/sphere/imaginary-1>

- Both Ways

<https://hubs.mozilla.com/fsbivuE/bothways-trieste>

<https://prezi.com/view/Lx7j8ilc0P0RIVe4wp5p/>



## **Izazov:**

Kako potaknuti interaktivnost i kreativnost u online okruženju za različite uzraste učenika?





<https://mod.srce.hr>

Lozinka za upis: om

← → ↻ 🔒 <https://mod.srce.hr/course/index.php?categoryid=138> 🔍 ☆ ⌘ 👤 ⋮

**MoD** sustav za e-učenje

50 srce Sveučilište u Zagrebu Sveučilišni računski centar

☰ Work on the system ▾ Helpdesk ▾ My courses ▾ 🔔 💬 📧 ▾ Vedrana Mikulić Crnković 👤 ▾

🏠 Dashboard 📅 Calendar 📁 Private files 📁 All courses 🔍 Search

## Prirodoslovno-matematičko područje Full screen

Dashboard ▸ My courses ▸ Prirodoslovno-matematičko ...

Course categories: Prirodoslovno-matematičko područje ▾

Search courses

### 📌 Matematički cirkus 🔍 🔍

Voditelj kolegija: [Bojan Crnkovic](#)  
Voditelj kolegija: [Vedrana Mikulic Crnkovic](#)  
Asistent: [Ivona Novak](#)


U okviru programa popularizacije financiranog od Ministarstva znanosti i obrazovanja djelatnici Odjela za matematiku i Marko klaun osmislili su i izradili više aktivnosti (online predavanja, virtualne radionice, videa,...) kojom opisuj veze matematike i elemenata cirkuskog showa. Sve su aktivnosti implementirane u okviru online kolegije te vas pozivamo da se upustite u samostalno istraživanje i saznate odgovor na pitanje treba li klaun Marko znati matematiku.

Matematički cirkus namijenjen je prvenstveno učenicima osnovnih i srednjih škola, ali i svima koji žele "probuditi" klauna u sebi.

### 📌 InAMath - An interdisciplinary approach to mathematical education 🔍 🔍


Voditelj kolegija: [Bojan Crnkovic](#)  
Voditelj kolegija: [Vedrana Mikulic Crnkovic](#)  
Asistent: [Ivona Novak](#)  
Asistent: [Loris Raspolic](#)  
Asistent: [Nenad Trinajstic](#)

Online kolegij InAMath razvija se u okviru istoimenog projekta s ciljem osmišljavanja edukacije učitelja razreda nastave za osmišljavanje, razvoj i provedbu interdisciplinarnih matematičkih aktivnosti.

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

### 📌 Imaginary 🔍

Voditelj kolegija: [Vedrana Mikulic Crnkovic](#)  
Asistent: [Bojan Crnkovic](#)  
Asistent: [Ivona Novak](#)  
Asistent: [Bojan Ostic](#)



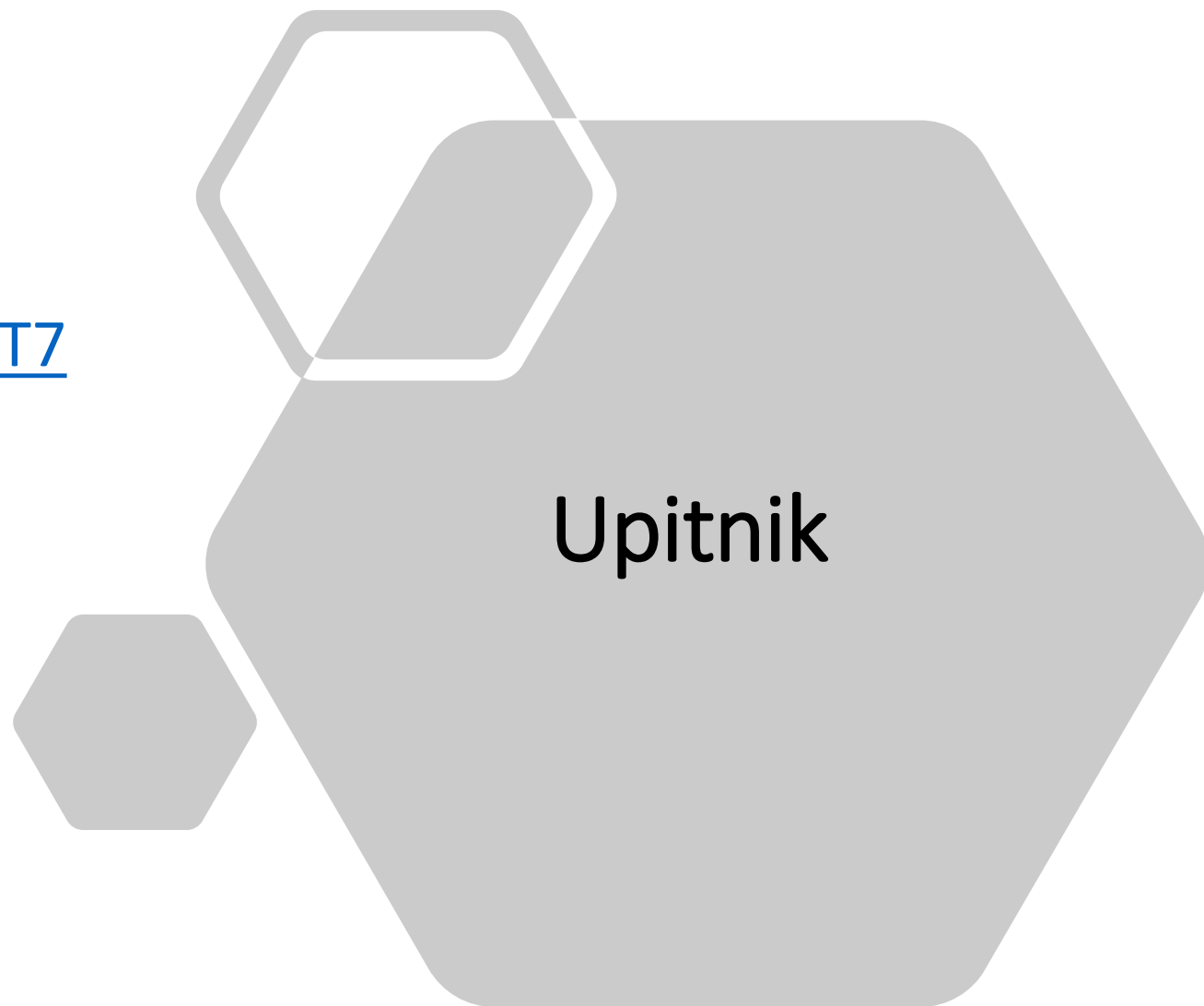
- Udaljena nastava i e-poučavanje svakako imaju svoje mjesto u redovnoj nastavi,
- digitalni alati i online okruženje doprinose popularizaciji znanosti,
- u potpunosti online nastava nosi sa sobom brojne izazove,
- kontakt uživo je nezamjenjiv,
- digitalna pismenost je izuzetno važna.

A decorative graphic on the right side of the slide. It features a large, light gray hexagon with rounded corners. Overlapping its top-left corner is a smaller, white-outlined hexagon. To the left of the large hexagon is a smaller, solid gray hexagon. The text "Što smo naučili?" is centered within the large hexagon.

Što smo naučili?



<https://forms.gle/4bhsmlPaKuzfFB5T7>





Hvala na pažnji!

Pitanja?

[vmikulic@math.uniri.hr](mailto:vmikulic@math.uniri.hr)