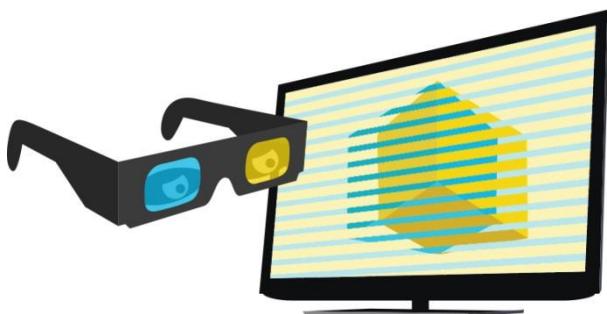


# **THE LIVING GEOMETRY AS SEEN BY THE EYES OF COMPUTER**



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**ICT WORLD: imaging, coding, transforming and simulating the world**

**2017**

**On the 30 of January 2017 our school held the annual intellectual marathon. The session of computer sciences was run under the title “**The living geometry as seen by the eyes of computer**”. To fulfil the tasks students used the dynamic environment GeoGebra. 136 students from different schools of Latvia participated in this event this year.**

The tradition to organize an intellectual marathon exists in our school for 20 years. This is an individual intellectual competition, in which participants have to show their horizons and be creative in seven different sessions. The duration of each session is 25 minutes with a 5 minutes break between sessions. Each stage is associated with a school course: native language, English, mathematics, science, practical economics, history, geography, heuristics. The session of computer Science was organized for the first time this year. This is due to the fact that we want students and teachers from different schools learn about **the project”ICT WORLD – Imaging, Coding, Transforming and Simulating the World”**.

Works of participants are evaluated by specially developed criteria at each stage separately on a scale of 30 points. The winners are determined both at each stage separately in different age groups, as well as in the overall standings.

Student's worksheets you can see on the next pages.

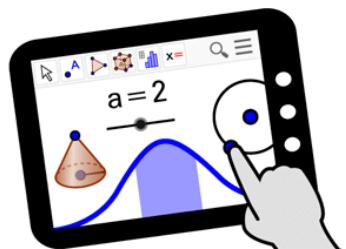
# INTELLECTUAL MARATHON - 2017

The session of computer sciences “LIVE GEOMETRY AS SEEN BY THE EYES OF COMPUTER”

## GRADE 8-9

**GeoGebra** - it is the most popular free of charge math programme. In November 2009 this programme of “live constructions” was awarded the Tech Awards 2009 prize. Its author is **Markus Hohenwarter**, an Austrian mathematician.

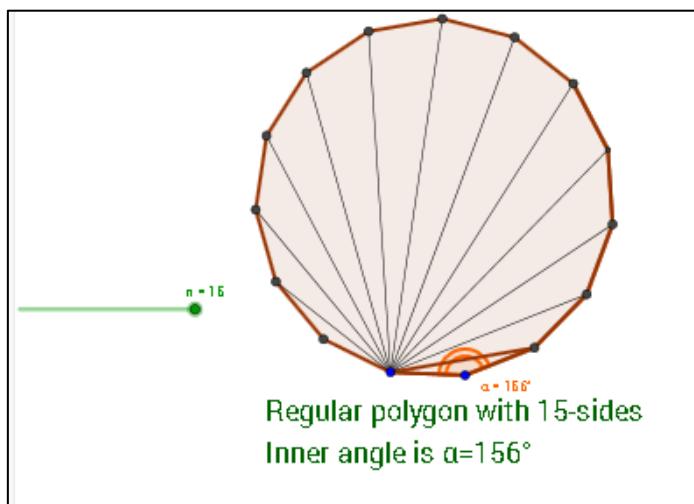
You have **25 minutes** to fulfill two tasks!



**Task 1.** A polygon is called **regular** if its all sides and all inner angles are equal. There is an endless number of regular polygons in geometry: a regular triangle, a regular quadrangle which is called \_\_\_\_\_ etc. Now try to write the formula how to calculate the inner angle of a regular polygon using GeoGebra.

1) Open the **GeoGebra Applet** “Inner angle of regular polygons”:

<https://www.geogebra.org/m/Bf7SySKM>



2) By pressing the left button of the mouse take hold of the Slider and place it in the initial position  $n=3$  ( $n$  – the number of sides of a regular polygon).



3) Now you can see a regular polygon with 3 sides un it is called a regular \_\_\_\_\_. The value of its inner angle is \_\_\_\_\_. .

4) Push the Slider forward by one unit at a time, look at the formed regular polygons and the values of their inner angles. Fill in the table:

$n$ – number of sides of a regular polygon	Value of inner angle of a regular polygon	Sum of inner angles of a regular polygon
4		
5		
6		
7		
8		
9		
10		

5) Write a formula how to calculate the value of the inner angle of a regular polygon depending on the number of its sides.

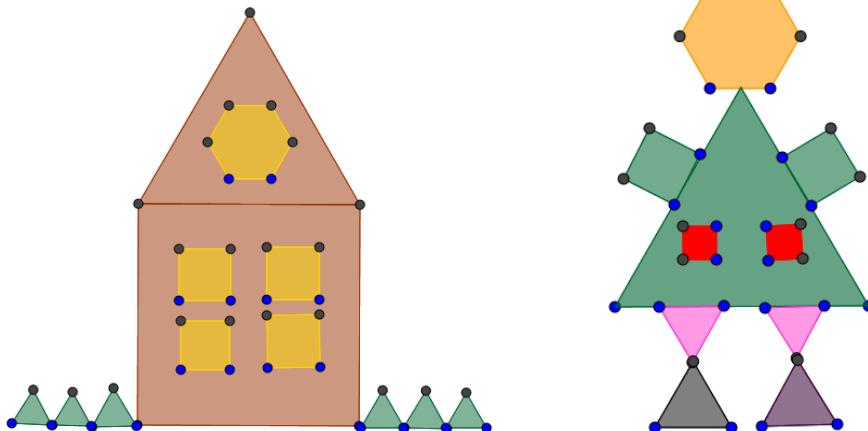
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6) Close the file. Do not save the changes you have made.

## Task 2.

1) Activate the dynamic mathematical programme **GeoGebra** , maximize its window full screen.

2) Look at the pictures.



Now give way to your imagination and using **GeoGebra** make your own picture which consists of no less than **3 types of regular polygons no less than 12 in total**. TO FULFIL THE TASK USE THE FOLLOWING TOOLS:



- the tool **REGULAR POLYGON** . Choose the tool, then draw the segment as a side of a regular polygon and in the coming up window put in the desirable number of regular polygon sides;



- the tool **MOVEMENT** . Choose the tool, replace and arrange the figures you have drawn; colour the picture if you wish.

3) Save the picture in the file **NameSurnameGrade.ggb** (for example, JohnGreen8grade.ggb) on the Desktop.

4) Close all the windows.

**Thank you for your work!**

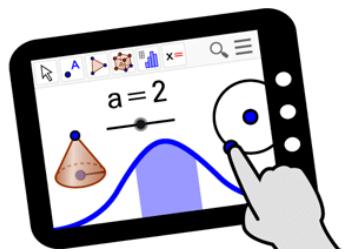
# INTELLECTUAL MARATHON - 2017

The session of computer sciences “LIVE GEOMETRY AS SEEN BY THE EYES OF COMPUTER”

## GRADE 10-12

**GeoGebra** - it is the most popular free of charge math programme. In November 2009 this programme of “live constructions” was awarded the Tech Awards 2009 prize. Its author is **Markus Hohenwarter**, an Austrian mathematician.

You have **25 minutes** to fulfill two tasks!

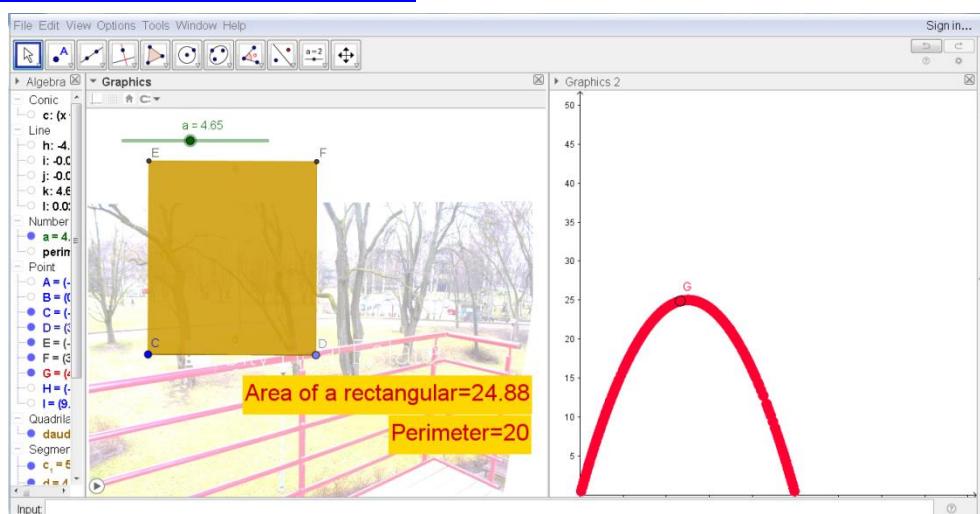


### Task 1

**Situation:** a gardener has a metal wicker roll **20m** with which he wants to enclose part of his garden to grow flowers so that it has the largest possible area. Look in the dynamic model of this situation made by means of GeoGebra and make a hypothesis of how long the sides of the garden should be.

1) Open the **GeoGebra Applet “Area of a rectangular”**:

<https://www.geogebra.org/m/skRhGwUB>.



2) Press the left button of the mouse, take hold of the slider and place it in the initial position **a=0** (a changes from 0 to 10 as a half perimeter of a rectangular).

3) Move the slider forward, watch how the rectangular changes. Also pay attention to how the graph of the descriptive function is forming on the right side of the graphical view.

4) **Answer the questions:**

a) What is the largest possible area of the garden which can be enclosed by a 20 m long metal wicker roll?

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b) How long do the sides of the garden have to be?

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c) Write the formula of the descriptive function that shows the relationship between side of the garden and its area.

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d) What is the domain and the range of the function?

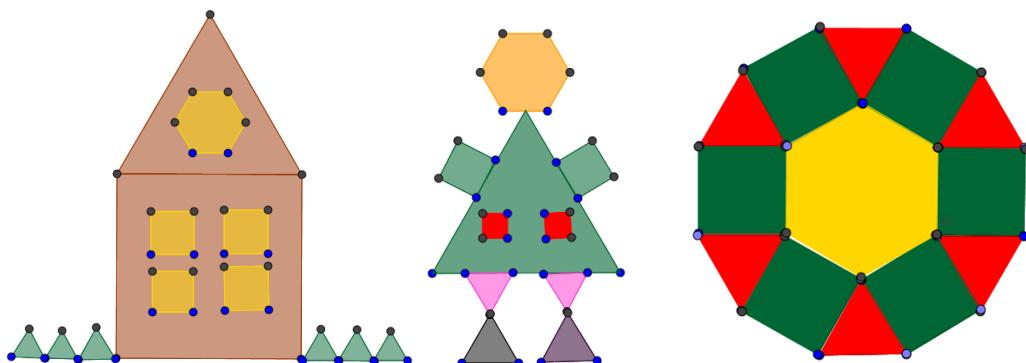
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5) Close the file. Do not save the changes you have made.

## Task 2.

- 1) Activate the dynamic mathematical programme **GeoGebra** , maximize its window full screen.
- 2) Look at the pictures.



Now give way to your imagination and using **GeoGebra** make your own picture which consists of no less than **3 types of regular polygons no less than 15 in total**. TO FULFIL THE TASK USE THE FOLLOWING TOOLS:



- the tool **REGULAR POLYGON** . Choose the tool, then draw the segment as a side of a regular polygon and in the coming up window put in the desirable number of regular polygon sides;



- the tool **MOVEMENT** . Choose the tool, replace and arrange the figures you have drawn; colour the picture if you wish.

3) Save the picture in the file **NameSurnameGrade.ggb** (for example, JohnGreen8grade.ggb) on the Desktop.

4) Close all the windows.

**Thank you for your work!**