

MATHS MODULE PLAN

TOPIC of the module: Quadrangles: Convex Quadrangles; Particular Quadrangles

Age of students: 13

Number of students: 24

Required prior **knowledge**: none

Objectives:

- Students will be able to identify particular quadrangles by using the indicated properties.
- Students will be able to use the metrical and qualificative properties of the quadrangles in solving problems.
- Students will be able to use geometrical representations of quadrangles in their work.
- Students will be able to choose the adequate geometrical representations.

Opportunities

- Students will be able to identify correctly the properties of the human body proportions in relation to the symmetry axis
- Students will be able to measure correctly the head's dimension, which represents the base element in the representation of the human body.

Resources: geometry kit, meter, play dough, wire, aluminum foil,

Time frame: 5 lessons (50 minutes/lesson)

Arts involved: drawing, modeling

Methods of work: pair work, group work

Procedure / steps

1. *Warm-up*: a short introduction in the lesson

The Golden Ratio

“Mathematics is the music of the reason” said James J. Sylvester.

Who has not noticed surprisingly how much symmetry and order there is in nature? Many of us can see that nature has used in its venture mathematical formulas which have created everything that is around us.

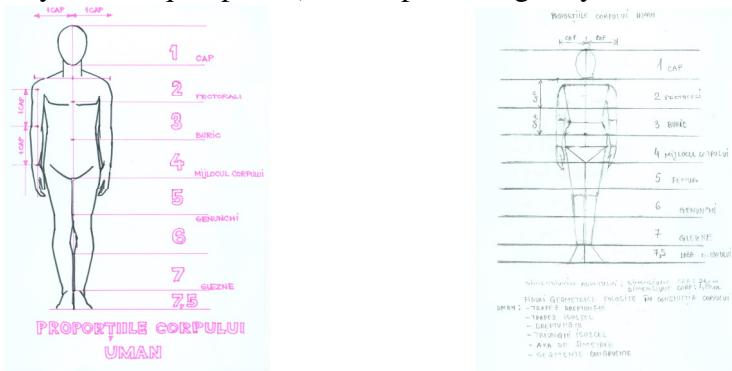
The functions of the “golden ratio”, actually of the proportions, can be found in works of architecture, painting, sculpture, aesthetics and art in general. The “golden ratio” can be found in the

construction of the golden rectangle, Pitagora's isosceles triangle, the golden ellipse from the Hindu culture and the golden spiral.

Leonardo da Vinci in his drawing "Vitruvian Man" highlights the connection between the ideal human proportion and geometry. He describes the human body as the main source of proportions for the classical architecture and he notices that the ideal body should have the height of 8 heads.

Leonardo's drawing proves the relation between mathematics and art from Renaissance time and reveals his complex ideas about proportions. It also shows that the centre of a circle and the centre of the square is actually the centre of the human body, which is the navel.

In our lesson, this proportion theory is used by students in the execution of a drawing, of an adult, with a height of 1,8 m, having as a base element the head (24 cm) in the proportional division of the human body in 7,5 equal parts (the last part being only half of the head's dimension).



2. The Measurement

First of all students measure on the mathematics sheet of paper equal parts and they mark them by drawing parallel lines. Then, students are divided into pairs and they measure each other's head. This measurement will be the basis in the drawing of their own bodies.

After students trace the equal parts in their drawings the teacher tells what each part represents: 1 is the head; 2, 3 and 4 are the body; 5, 6 and 7 are the legs; and the last one, which is only half of one part, is the foot.





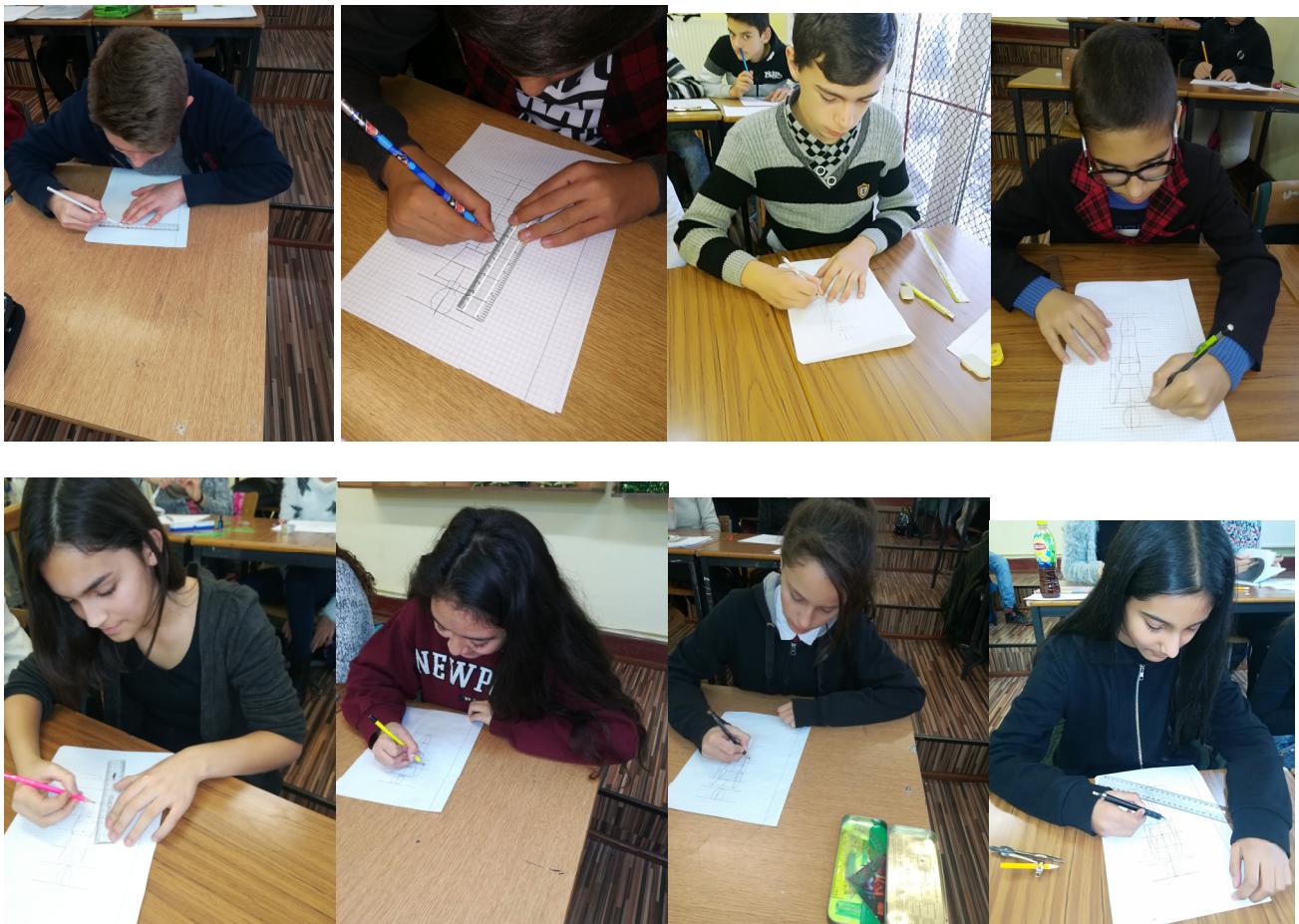
3. The Drawing

After the students have all the necessary information about the proportions of the human body they begin drawing. First they draw the symmetry axis. In the first part that they traced on their maths paper they draw the head by making two equal ovals, one on each side of the symmetry axis. Then they draw the neck, which continues into the shoulder line, and then the shoulders, which are marked through two segments congruent to the head dimension.

In parts 2 and 3 the body is marked by an anti-parallelogram in women and a rectangle in men. Then, the hips are marked, also by an anti-parallelogram. In part 4 a rectangle marks the pelvis. To make the connection between the body and the legs they draw an isosceles triangle.

The legs, which are thicker in the upper part and thinner towards the knees, are marked by a right-angled parallelogram. The calves are below the knees and because they get thinner towards the ankles they are also marked by a right-angled parallelogram. In the last part, which is the smallest, they draw the foot.

The arms are connected to the shoulder line and their dimension is twice that of the head. The elbow is marked through a line from the navel and the hand is the last part of the arms.



Rădulescu Daniela
Proportii corpului uman.

Luminări adăugate: Dimensiuni cap: 9 cm.
Dimensiuni corp: 17 cm.
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Dimensiuni corp: 17 cm.
Tipuri geometrice folosite în construcția corpului uman:
- TRIEZE EQUILATERAL
- TRIEZE ISOSCEL
- TRIEZE DREPTUNGHI
- TRIEZE ISOSCEL DREPTUNGHI
- TRIUNGHI ISOSCEL
- CERC
- SEMICERC
- CERCUMFERINȚĂ

CĂLINESCU LUCIA
Proportii corpului uman

Luminări adăugate: Dimensiuni cap: 9 cm.
Dimensiuni corp: 17 cm.
Tipuri geometrice folosite în construcția corpului uman:
- TRIEZE EQUILATERAL
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- CERC
- SEMICERC
- CERCUMFERINȚĂ

Romanescu Daniel
Proportii corpului uman (CF și AP)

DIMENSIUNILE ADĂUGATE IMAGINI CAP: 15 CM
DIMENSIUNE CORPULUI: 35 CM
FIGURI GEOMETRICE FOLosite ÎN CONSTRUCȚIA CORPULUI UMAN: TRIEZE ISOSCEL - AXA DE 3 METRIE
- DREPTUNGHI
- TRIUNGHI ISOSCEL - SEGMENTE CONGRUENTE

Bogdan Mihai
Proportii corpului uman

Dimensiuni adăugate: Dimensiuni cap: 9 cm.
Dimensiuni corp: 17 cm.
Tipuri geometrice folosite în construcția corpului uman:
- TRIEZE DREPTUNGHI - TRIUNGHI ISOSCEL
- TRIEZE ISOSCEL - AXA DE 3 METRIE
- DREPTUNGHI - SEGMENTE CONGRUENTE

Pătrăuțiu Bogdan
Proportii corpului uman

Dimensiuni adăugate: Dimensiuni cap: 9 cm.
Dimensiuni corp: 17 cm.
Tipuri geometrice folosite în construcția corpului uman:
- TRIEZE DREPTUNGHI - TRIUNGHI ISOSCEL
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- DREPTUNGHI - SEGMENTE CONGRUENTE

Pătrăuțiu Bogdan
Proportii corpului uman

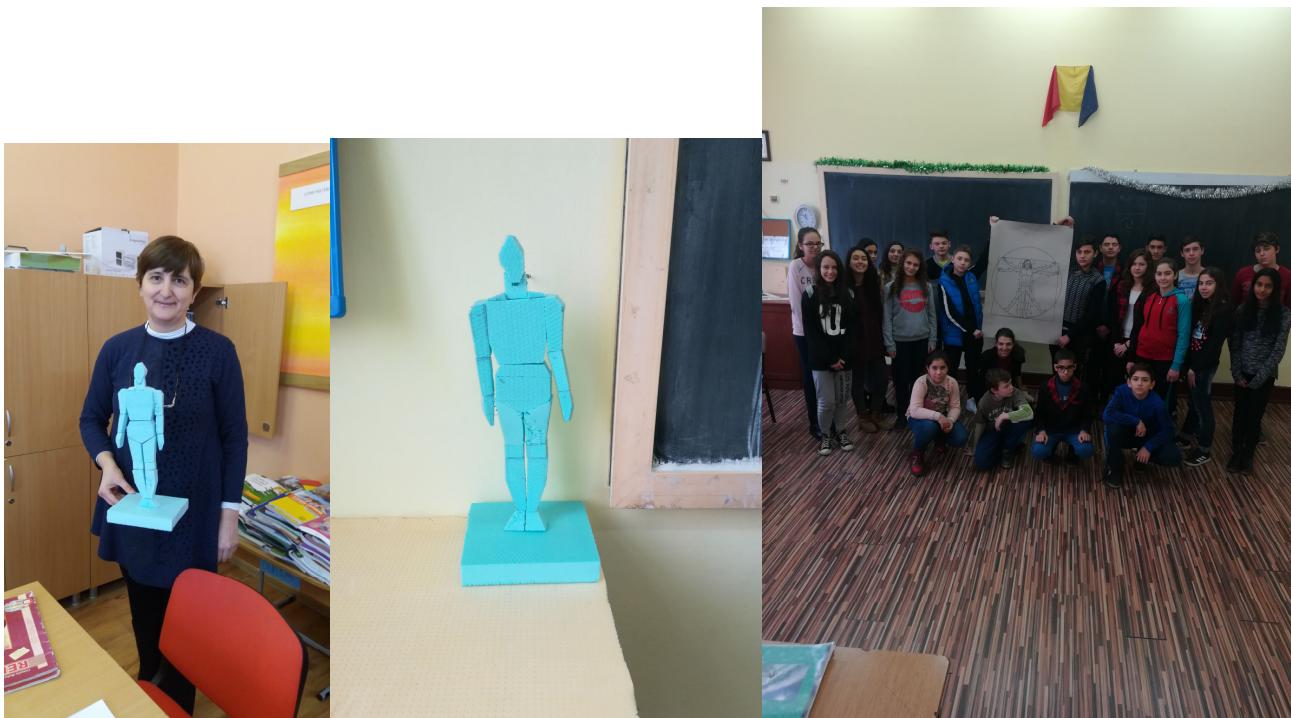
DIMENSIUNILE ADĂUGATE: Dimensiuni cap: 15 cm
- TRIEZE DREPTUNGHI - TRIUNGHI ISOSCEL
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- DREPTUNGHI - SEGMENTE CONGRUENTE

4. Evaluation

After the students have finalized their drawings, they need to write on their papers what geometrical structures they used. Also, by using the same proportion theory they are supposed to make another drawing, of the hands.

After they finalize the drawings the children start modeling human figures from play dough. Students have to keep the proportions and the measurements they have done, but at a smaller scale. Some students make figures of the human body and other figures of the hand.





Evaluation summary and comments about how the module went: engagement of the students, difficulty, effectiveness, and improvement suggestions)

The students were very involved in the entire module and they really enjoyed applying what they learned in the maths lessons in their drawing and modeling. They found that the lesson was entertaining and they understood better the concepts because they applied practically what they learned.