

The background of the slide features a dark, grainy image of the Mona Lisa. Overlaid on the image are several thin, light-colored lines: a vertical dashed line, a horizontal dashed line, and a solid curved line that forms a semi-circle on the right side of the painting.

(ENG) What does Leonardo Da Vinci have to do with a calculator?

Introduction

Step 1 - Motivational Stage

Step 2 - Investigational Stage

Step 3 - Consolidation Stage

Introduction



#In-class activity #Inquiry-based learning #Experimental learning #Gamified learning #Simulation

Pupils will use a calculator to calculate body proportions based on the Vitruvian Man's golden proportions.

Based on body measurements, they will determine the relations (proportions) between:

- the total height of the human body and the height of the navel,

- the length from the shoulder to the tip of the fingers and the length from the elbow to the tip of the fingers,
- hip height and knee height,
- the distance from the torso to the end of the hand and arm,
- the distance from the top of the head to the lower part of the chin and from the lower part of the chin to the navel (belly button)
- the distance from the pubic area to the knees and the distance from the navel to the pubic area.

Learning Objectives

☐

Acquire knowledge and define the concept of the Golden Ratio

☐

Calculate their body proportions based on the sketch and their understanding of the Vitruvian man

☐

Learn to use a pocket calculator

☐

Recognize and write the ratio of two quantities

ACTIVITY DETAILS

Activity Details

Connection of the activity with Art —

Artists have been concerned with depicting the ideal proportions of the human body since antiquity and Renaissance. With the help of the golden ratio, they created a perfect representation of man, who is depicted as the Vitruvian Man by Leonardo da Vinci.



Link to local, national School Curriculum —

Percentage/Use of pocket calculator



Equipment required —

- A Computer
- A Metre
- A pencil
- A sheet of paper (A4)
- A pocket calculator



Duration of activity —

45 minutes



Sources —

Credits:

- Figure 1: https://en.wikipedia.org/wiki/Vitruvijev_%C4%8Dlovek#/media/Slika:Vitruvian_Man_by_Leonardo_da_Vinci.jpg
- Figure 2: <https://www.t3tech.si/trendi/novica/carobni-zlati-rez/>
- Figure 3: smaller : bigger = bigger : whole
- Figure 4: https://en.wikipedia.org/wiki/Kheopsova_piramida#/media/Slika:Kheops-Pyramid.jpg
- Figure 5: <https://sites.google.com/site/zlatirezprojektnanaloga/>
- Figure 6: Gold spiral display (source 99 designs).
- Figure 7: Display of the golden rectangle (source Research Gate)
- Figure 8: Christ's Last Supper; <http://www2.arnes.si/~mmlaka10/KRNeki/golden/Art4.htm>

- Figure 9: foto by Matjaž Bizilj, CC
- Figure 10: foto by Matjaž Bizilj, CC
- Figure 11: foto by Matjaž Bizilj, CC
- Figure 12: foto by Matjaž Bizilj, CC
- Figure 13: foto by Matjaž Bizilj, CC
- Figure 14: foto by Matjaž Bizilj, CC
- Figure 15: foto by Matjaž Bizilj, CC
- Figure 16: foto by Matjaž Bizilj, CC
- Figure 17: foto by Matjaž Bizilj, CC

Step 1 - Motivational Stage



Explain:

Artists have been concerned with depicting the ideal proportions of the human body since antiquity and Renaissance. The most famous work in mathematics and the proportions of the human body is the Vitruvian Man. It is a drawing by the renowned Italian architect, inventor, sculptor and painter Leonardo da Vinci. According to the notes of the Roman architect Vitruvius, Leonardo corrected the dimensions of the human body according to his studies and measurements. He created a sketch expressing the human body's ideal proportions (1490).

Figure 1:

https://en.wikipedia.org/wiki/Vitruvijev_%C4%8Dlovek#/media/Slika:Vitruvian_Man_by_Leonardo_da_Vinci.jpg

The Vitruvian Man drawing is an illustration for a book dedicated to the writings of Vitruvius, created by Leonardo Da Vinci around 1490-1492. It depicts the figure of a naked man in two prone positions: outstretched arms on the sides describing a circle and a square.

Vitruvius commented on Leonardo Da Vinci's ideal human body proportions, with arms and legs extended outwards. They were adjusted to perfection in the geometric body of the circle and the square. Leonardo listened to him and adjusted the position and the ratio between the circle and the square. He realized the words of Vitruvius in the picture. He placed the centre of the square slightly lower than the centre of the circle.

The human body is composed according to the principle of the golden ratio, which means that everything in an ideal person is in the proportion (ratio) Φ ($\Phi=1.618033989\dots$)

GOLDEN RATIO (GOLDEN SECTION)



Figure 2: <https://www.t3tech.si/trendi/novica/carobni-zlati-rez>

The Golden ratio is the most beautiful proportion between two different quantities. It expresses the harmony of perfection, and to the human eye, this ratio appears perfect. Many ratios in nature and the human body approximate the golden ratio. The golden ratio was purposely included in outstanding artistic achievements of humanity, both in music, architecture, painting, etc.

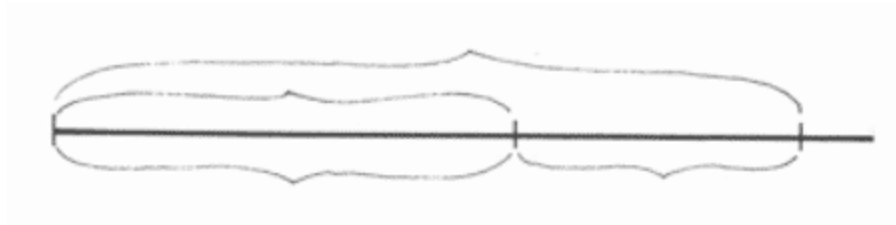


Figure 3: smaller : bigger = bigger : whole

The golden ratio appears in the time of the Egyptians in the construction of the oldest and largest pyramid in Giza. The most famous one is the Pyramid of Cheops, also known as the Great Pyramid.



Figure 4: https://en.wikipedia.org/wiki/Kheopsova_piramida#/media/Slika:Kheops-Pyramid.jpg

The golden ratio also manifests itself in nature, music and art.



Figure 5: <https://sites.google.com/site/zlatirezprojektanalog/>

Many of Leonardo's paintings are composed in the golden ratio. For example, The Last Supper, Mona Lisa, etc.

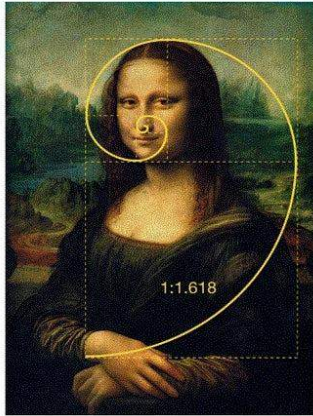


Figure 6: Gold spiral display (source 99 designs).

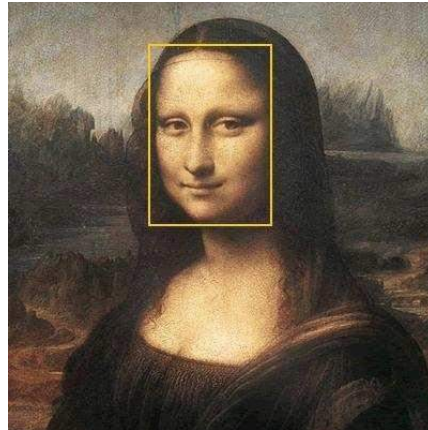


Figure 7: Display of the golden rectangle (source Research Gate)

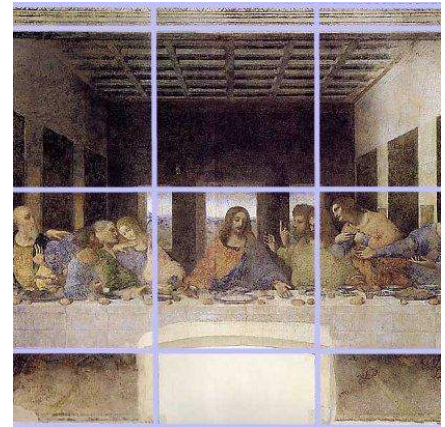


Figure 8: Christ's Last Supper;
<http://www2.arnes.si/~mmlaka10/KRNeKi/golden/Art4.htm>

Everyday life problem

Explain: We want to measure body and calculate the body proportions according to the principle of the golden ratio. You will use the picture of a man to make measurements (print the picture as a man on A3 paper). You can also use teddy bear instead. We will use a pocket calculator for calculations.

Consolidation of already known content

Golden Ratio and Vitruvian Man.

Step 2 - Investigational Stage



STUDENTS' TASKS

1

Task 1

Explain:

Divide into pairs. Take a worksheet with pictures of what you need to measure, a space to write down the measurements and a space for the calculation.

Ask pupils:

Help each other with the measurements. Each measurement is repeated at least three times to make the results as accurate as possible. Then calculate the ratio in the table using a calculator.

Ask pupils to measure:

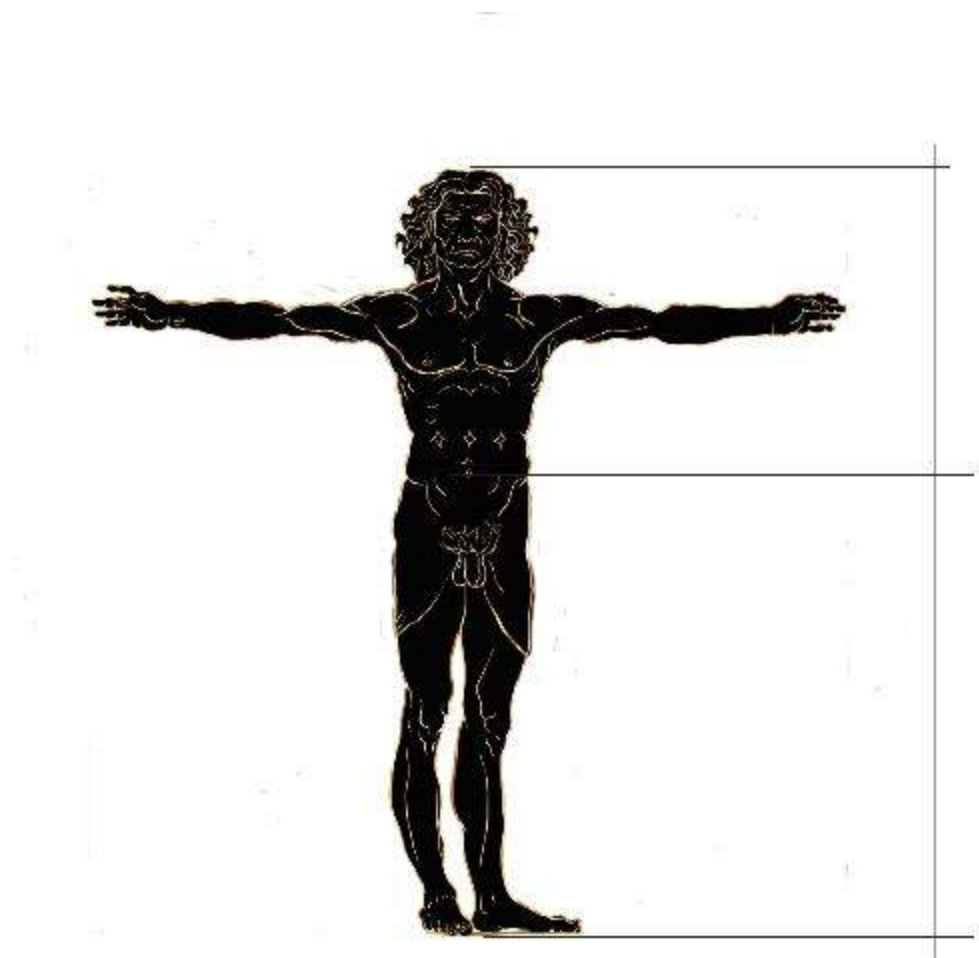


Figure 9

the total height of the human body and the height of the navel

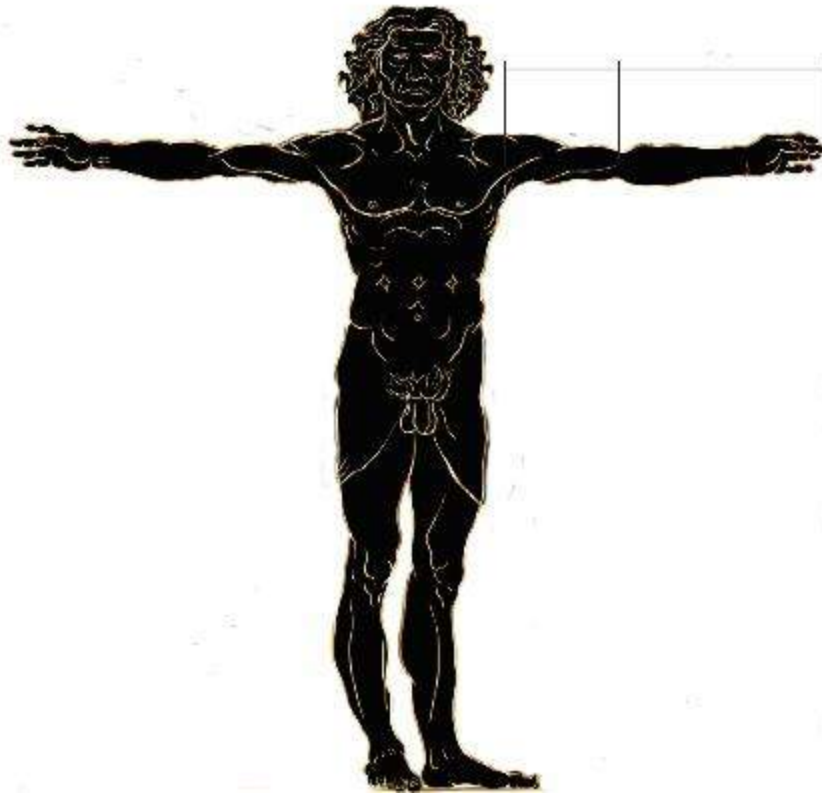


Figure10

the length from the shoulder to the tip of the fingers and the distance from the elbow to the tip of the fingers,

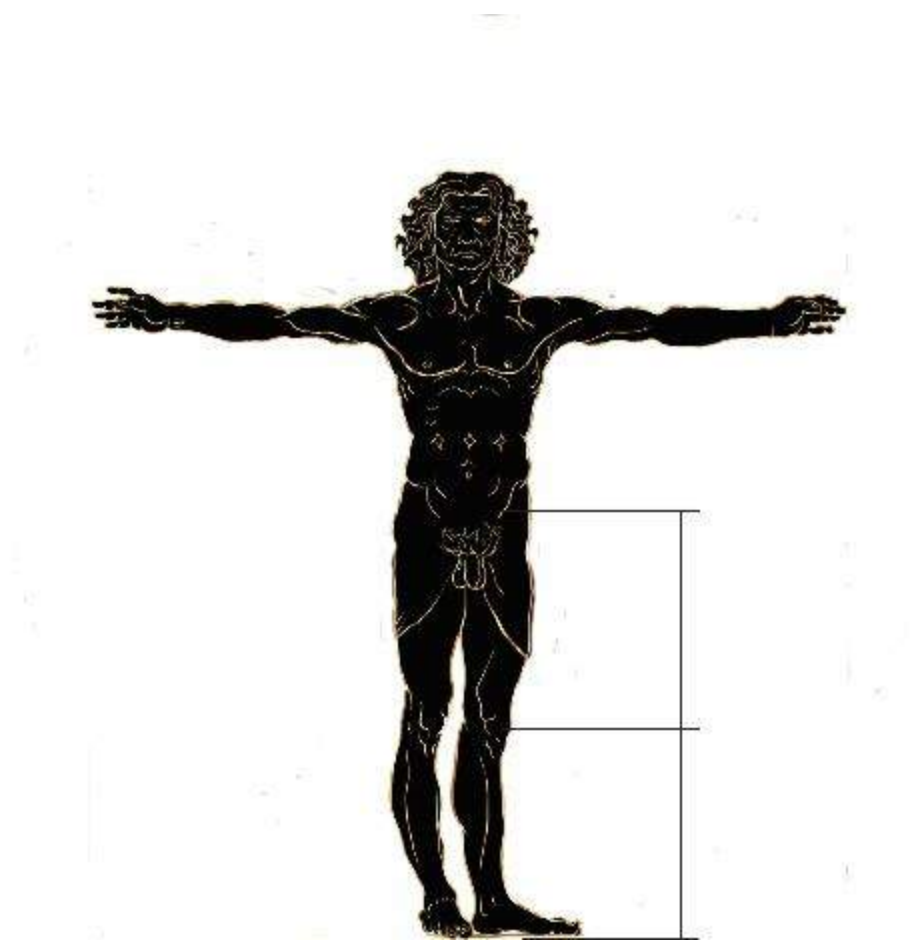


Figure11

the hip height and knee height,

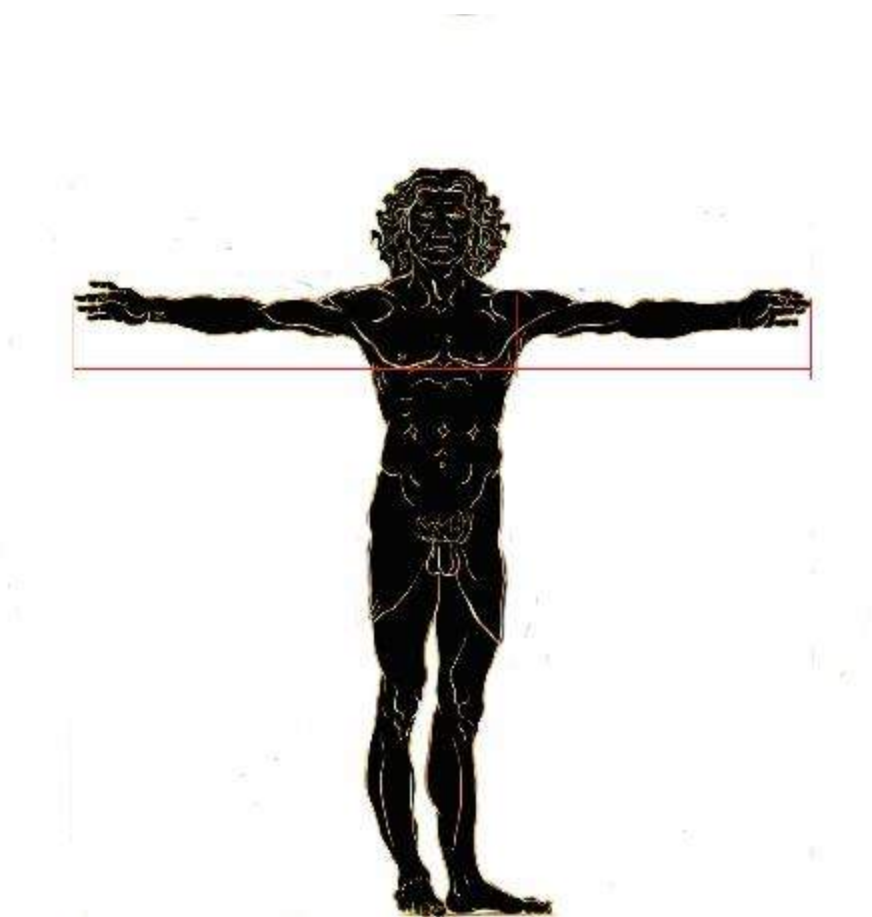


Figure12

the distance from the torso to the end of the hand and arm,

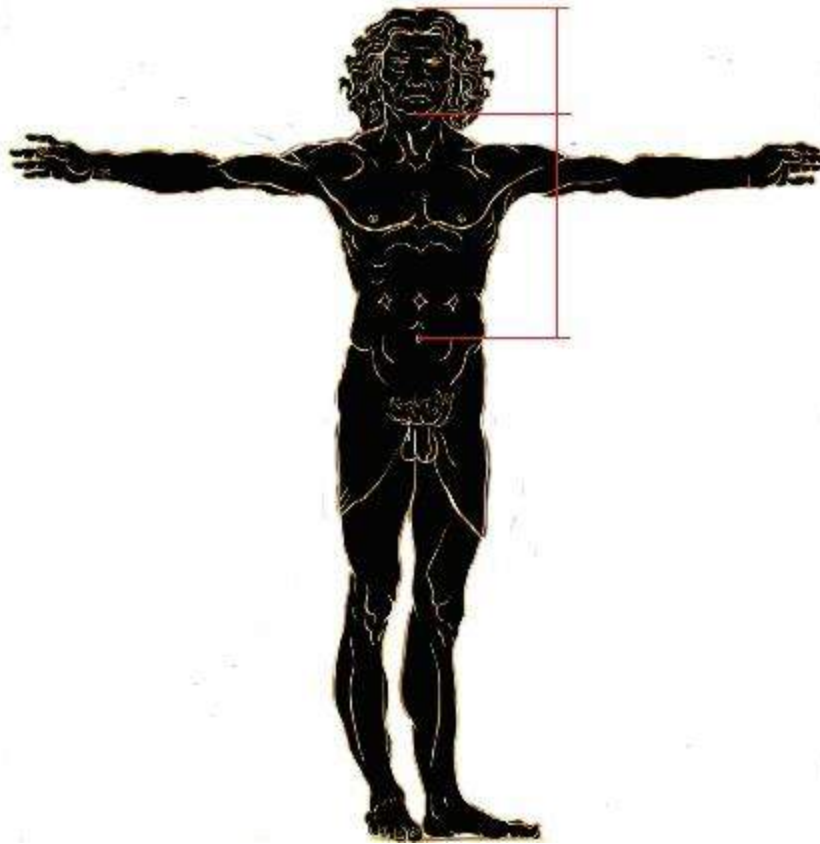


Figure13

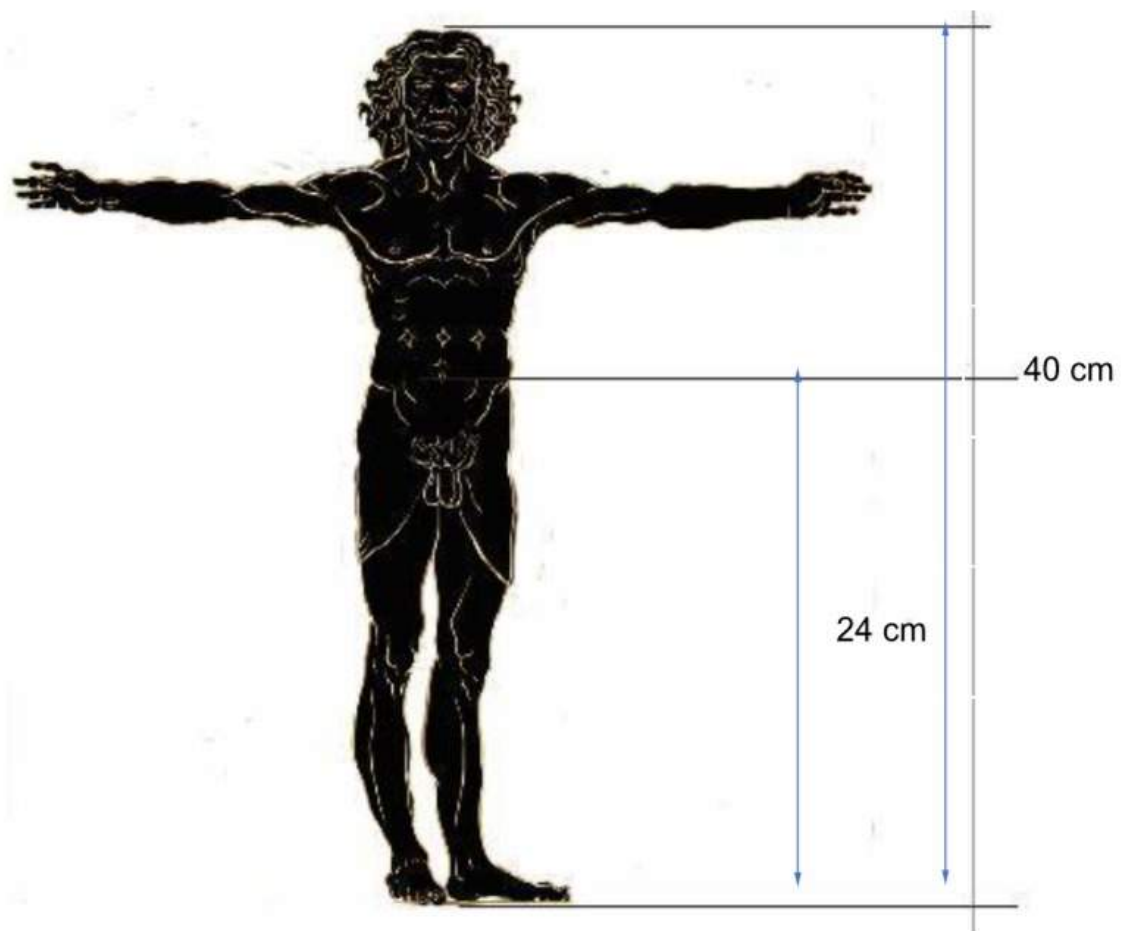
the distance from the top of the head to the lower part of the chin and from the lower part of the chin to the navel (belly button),

Ask pupils to:

write the results in the table. Then, calculate the individual ratios (golden numbers) using a pocket calculator.

Explain:

The man is 40 cm tall. The measured height from the feet to the navel is 24 cm. They calculate the ratio:



You can calculate the ratio with the calculator in two ways:

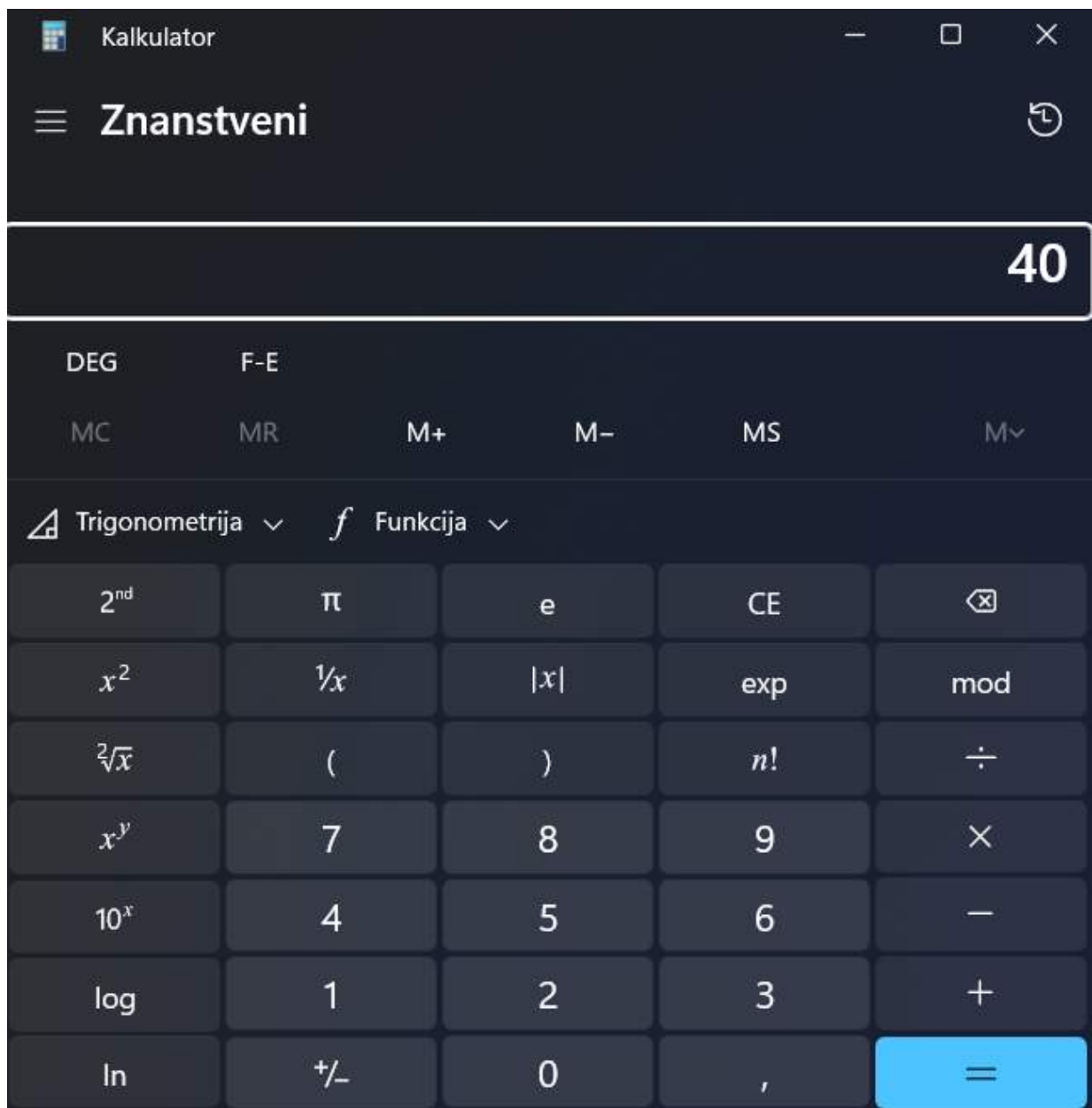


Figure 14

Enter the man's height (40 cm) into the calculator and press the button \div

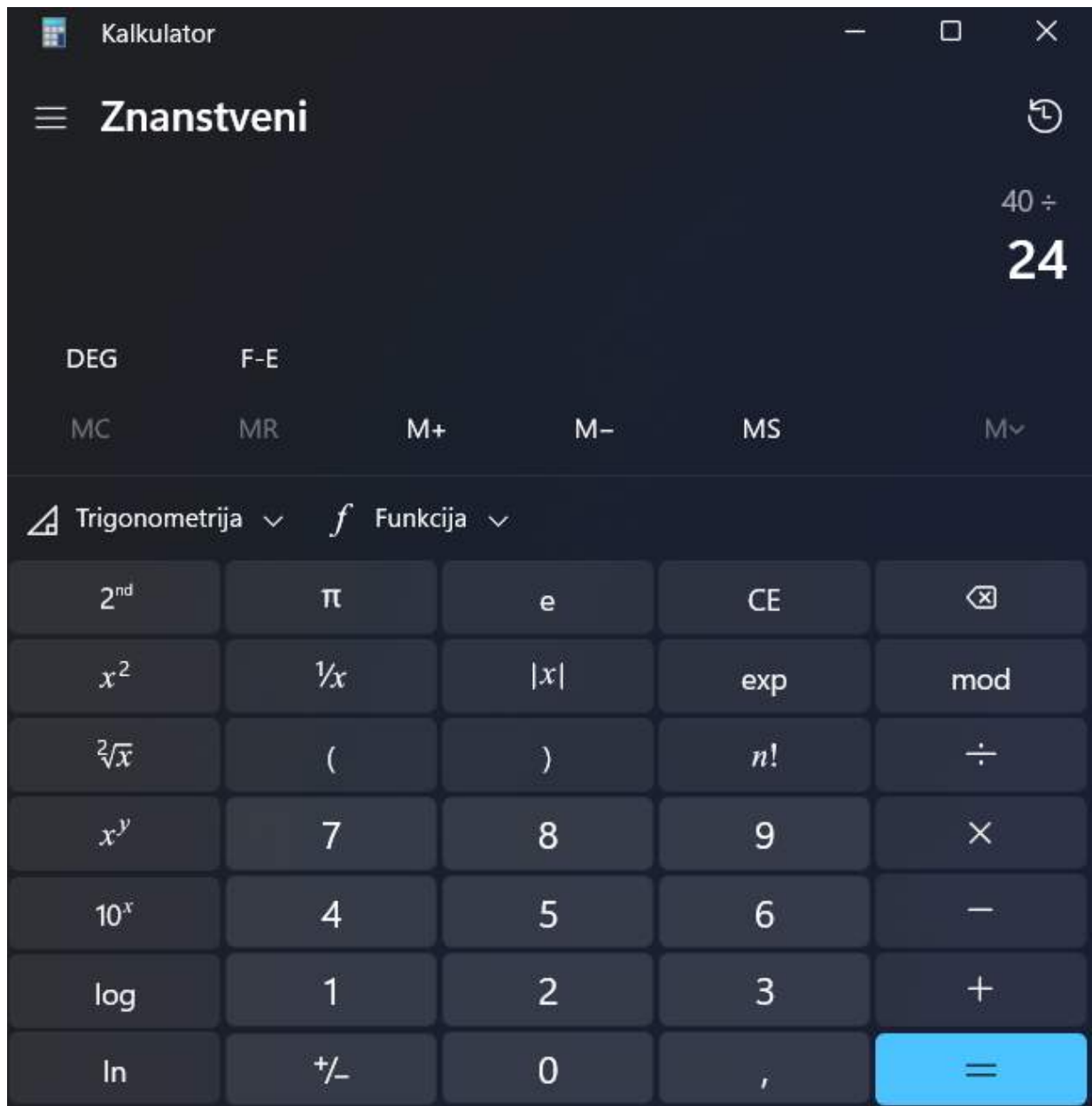


Figure 15

then enter the divisor (height to the navel = 24) and press =



Aks pupils to: use the calculator to calculate the remaining measurements.

Example	First measurement	Second measurement	Ratio
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1	40 cm	24 cm	1,667
2			
3			
4			
5			
Average of ratios			

Ask pupils to:

Use the calculator to calculate the average of the ratios you have calculated.

Explain:

You calculate the average by adding all the ratios and dividing by the number of ratios.

$$average = \frac{ratio\ 1 + ratio\ 2 + ratio\ 3 + ratio\ 4 + ratio\ 5}{5}$$

$$average = ratio\ 1 + ratio\ 2 + ratio\ 3 + ratio\ 4 + ratio\ 5 / 5$$

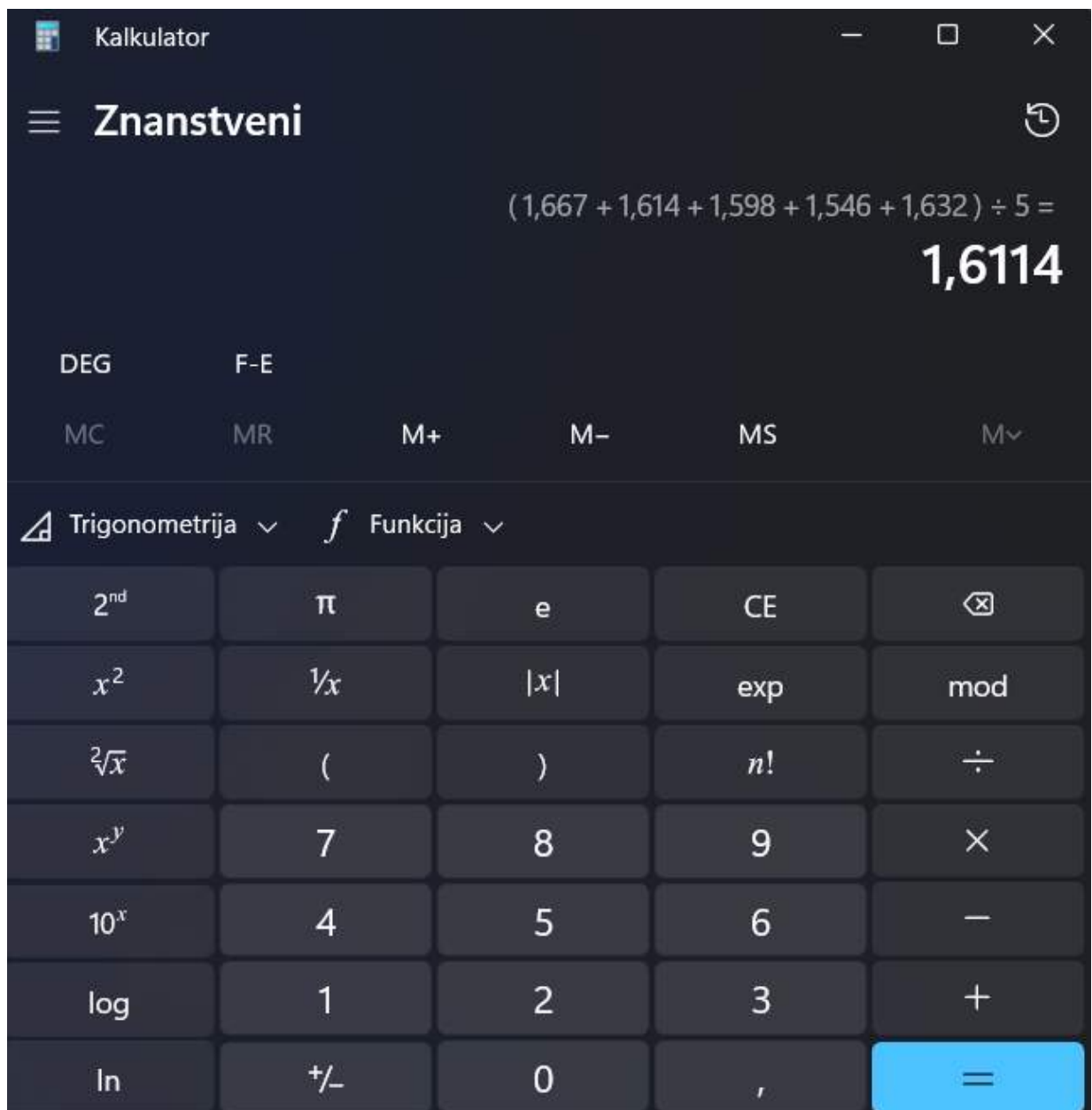


Figure 17

Be careful to use parentheses when using the calculator because the calculator takes into account the priority of the operations, and your result may be wrong.

According to the Vitruvian Man sketch, the result corresponds to the proportions of the human body.

Take a worksheet with pictures of what you need to measure, a space to write down the measurements and a space for the calculation. (worksheet at the end of the activity)

Summary

The pupils calculated the human body proportions using the measurements they took. In doing so, they established the reality or deviations from the representation of the golden proportions of the Vitruvian man, painted by Leonardo da Vinci. The Vitruvian man depicts the ideal human body in which everything is in the proportion of the golden ratio or golden number 1.618.

Step 3 - Consolidation Stage



To check pupils' understanding, they solve a task that includes measuring, using a pocket calculator, and knowing the artistic theme of the Golden Ratio and the Vitruvian Man.



human.pdf
222.7 KB



End of the activity

EXIT