EUROGEBRA WORKSHEETS

Interesting worksheets

EUROGEBRA WORKSHEETS

Introduction:

These worksheets were created within the Erasmus + project, Eurogebra.
Worksheets are in the field of mathematics and use the Geogebra program for individual mathematical tasks. The purpose is to use the program when teaching and explaining problems in mathematics and thus to approach the issue more clearly.
Worksheets are in the form of specific instructions and tools that will guide us to solve various tasks. In this way, students will get closer to a better understanding and modification of the given examples. Individual groups of worksheets can be combined with each other and create new subgroups according to the issues discussed. Some examples are followed by the solution of examples and free sheets for student notes.
Worksheets respect pedagogical documents related to the subject of mathematics. When working with worksheets, it is necessary to cooperate with teachers and coordinate their work.
In terms of content, we focused on geometric examples, where you can effectively solve problems and modify them in various ways. By formulating the tasks, we lead the students to understand the assigned tasks and to solve the tasks according to the individual steps in the worksheets.

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HANDSHAKING

MENU	TOOL	PROCESS STEPS
	Line Segment Tool	**Make a line segment linking Point A to Point B**
	Right Click on Point A	**Rename Point A to Albert**
	Right Click on Point B	**Rename Point B to Ben**
	Write down the number of handshakes	**In the table below write how many handshakes there were between Albert and Ben. (There should only be one☺)**
	Regular Polygon Tool	**Make a regular triangle by making two points and number of vertices 3**
	Right Click on Point A,B and C in turn	**Rename Point A , B and C to names beginning with those letters**
	Write down the number of handshakes	**In the table below write how many handshakes there were between A, B and C. (There are three line segments so should be three ☺)**
	Repeat the above process for a square, pentagon, hexagon, septagon and a octagon.	**Hint : You are doing it correctly if there are six handshakes for a square**

Table 1

Number of people	Number of handshakes
2	1
3	3
4	
5	
6	
7	
8	

Questions

1. Is there a pattern to the number of handshakes?
2. Can you predict how many handshakes there are between 9 people without drawing the shape?
3. Can you predict the number of handshakes for 10 people?
4. What type of number sequence is the pattern?

Extension

5. Can you work out the formula for the number sequence?

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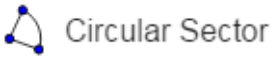
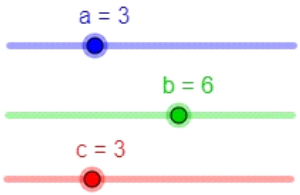
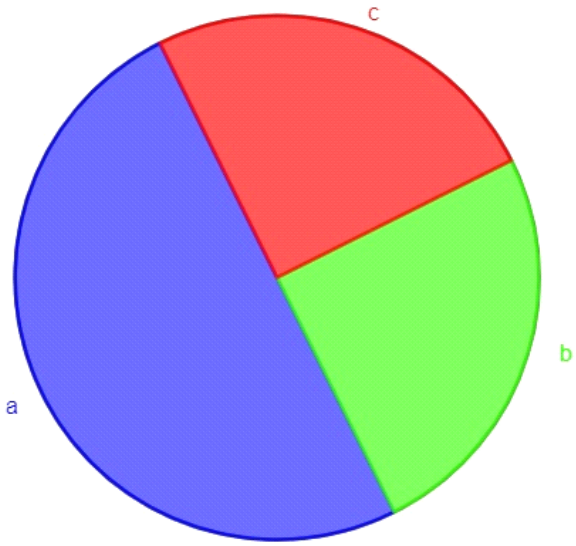
PIE CHART

MENU	TOOL	PROCESS STEPS
	 Slider	Create 3 sliders (*a*,*b* and *c*) *Min: 0 Max 10, increment 1*
		In the input bar type in: *s=a+b+c*
		In the input bar type in: α =360°
		In the input bar type in: β =360°
		In the input bar type in: Γ=360°
	 Circle with Centre through Point	Create a Circle with center *A*, going through *B*
	 Angle with Given Size	Create an angle with size α (click on B first, then on A, choose *anticlockwise)*
	 Angle with Given Size	Create an angle with size β (click on B' first, then on A, choose *anticlockwise)*
	 Angle with Given Size	Create an angle with size γ (click on B'' first, then on A, choose *anticlockwise)*

		Create circular sectors matching the angles created in the previous steps. (remember to always click on *A* first)
		Hide unnecessary objects and set the colours





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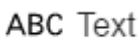
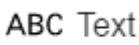
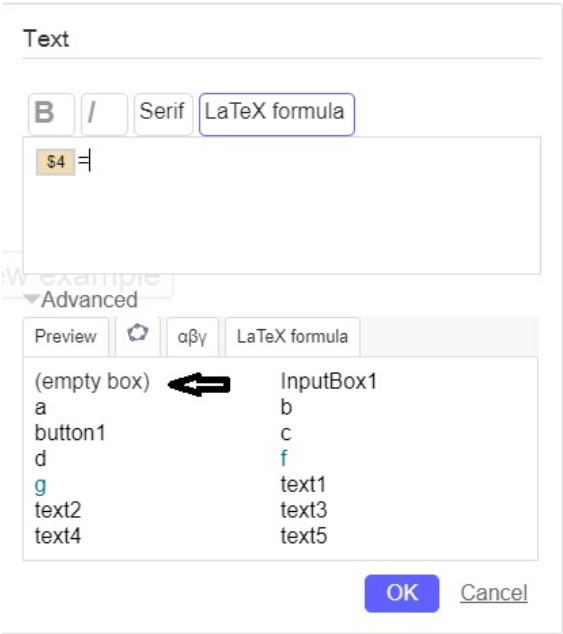
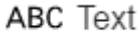
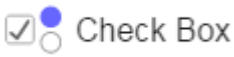
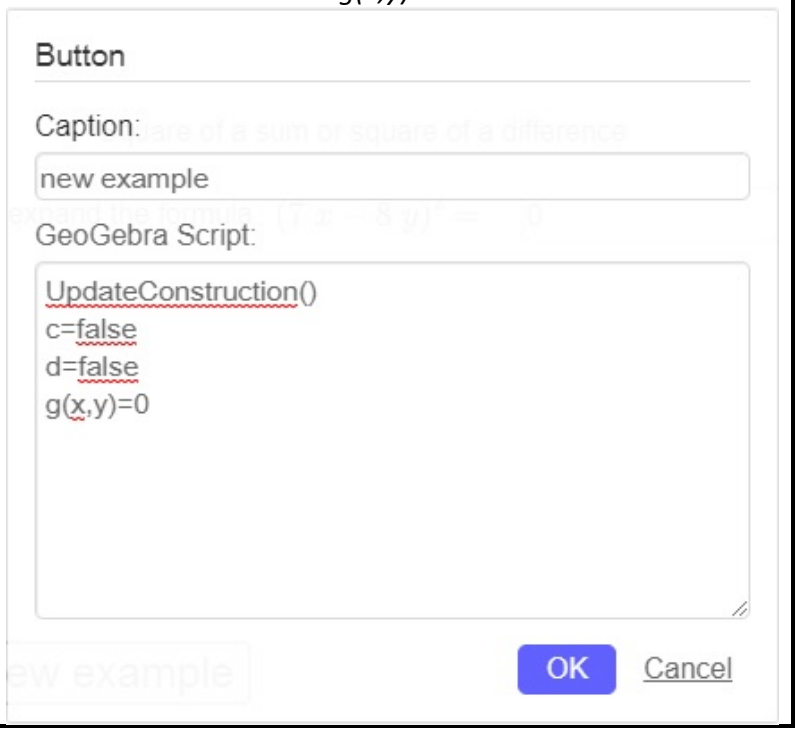
SHORT MULTIPLICATION FORMULAS

MENU	TOOL	PROCESS STEPS
		In the *Graphics* view hide the grid and both axes
		Open the *CAS* panel 
		In the *CAS* panel type in: *a: = RandomBetween(1,10)*
		In the *CAS* panel type in: *b: = RandomElement({1,2,3,4,5,6,7,8,9,10,-1,-2,-3,-4,-5,-6,-7,-8,-9,-10})*
		In the *CAS* panel type in: *GCD(a,b)* Note: GCD - greatest common divisor
		In the *CAS* panel type in: Factorise$\left(\left(\frac{a}{\$3}x+\frac{b}{\$3}y\right)^2\right)$
		In the *CAS* panel type in: *f(x,y): =$4*
		In the *CAS* panel type in: *G(x,y): = 0*

		In the *CAS* panel type in: *Expand($4)*
		Insert text: *Square of a sum or square of a difference*
		Insert text: *Expand the formula*
		Create a input box *Caption: formula* *Linked object: g(x,y)=0* Hide the label.
		In the *Input bar* type in: *text3 = if(f≠g,"wrong","good job!")*
		Insert dynamic text (text4) *$4=* Note: use the *(empty box)* function 
		Insert dynamic text (text5) $4=$7 Note: use the *(empty box)* function again
		Insert check box *c*: *Caption: check* *Object: text3*

a=2	Check Box	Insert check box *d*: *Caption: Show correct answer* *Object: text5* Go to *Settings* of this object->*Advanced,* in *Condition to show object* type in: $f \neq g \wedge c$
a=2	OK Button	Insert a button: *Caption: new example* *GeoGebra script: UpdateConstruction()* *c=false* *d=false* *g(x,y)=0*



End result:

Square of a sum or square of a difference

expand the formula $(x - 5\ y)^2 =$ x² + 10x y + 25y²

check wrong

show correct answer (x - 5y)²=x² - 10xy + 25y²

new example

EUROGEBRA WORKSHEET

SUM OF A GEOMETRIC PROGRESSION

MENU	TOOL	PROCESS STEPS
		Type in f(x)=2^x
		Click view and then spreadsheet
		Input 1,2,3,4,5,6,7,8,9,10 in column A by clicking on the bottom right corner and dragging down
		In column b type in f(A1). Fill the rest of the cells by clicking on the bottom right corner and dragging down
		In column c type in sum (B1:B10)
		Answer the questions below
		Change the value of r to a number less than 1 but greater than 0.
		Answer the question below

Questions:

1. The first term is 2. What do you have to do to get to the next term? Multiply by two

2. What about the third and forth terms and the nth term? Multiply by two

3. For the function f(x) , the first term is defined as a and the multiplier is defined as r. What expression would define the second term? ar

6. What about the third and forth terms? ar^2 and ar^3

7. What about the nth term? ar^(n-1)

8. Define the S as the sum of a series in terms of a,r and n. S= a+ar+....+ar^n-1

9. Multiply S by r. rS= ar+ar^2+...+ar^n

10. Subtract expression from step 9 from step 8 S-rS = a-ar^n

11. Factorise your expression and come up with an expression for S in terms of a,n and r.

S=a(1-r^n)/(1-r)

12. Check to see if this works with n=10, a=2 and r=2. Yes it does

13. Try different geometric sequences. Remember that the graph will be an exponential curve.

14. If you change the number 2 to a number less than 1 but greater than 0 what do you observe? The graph converges.

15. If the value is 0.5 what does this mean? This divides the previous term by 2.

16. What is the sum ? The sum converges to 1.

17. If you were to increase the number of terms to infinity what would happen to r^n if r is 0.5? It would tend to zero.

18. What would be the sum to infinity if r<1? S=a/(1-r)

19. If the value is -0.5 what does this mean? This divides the previous term by 2.

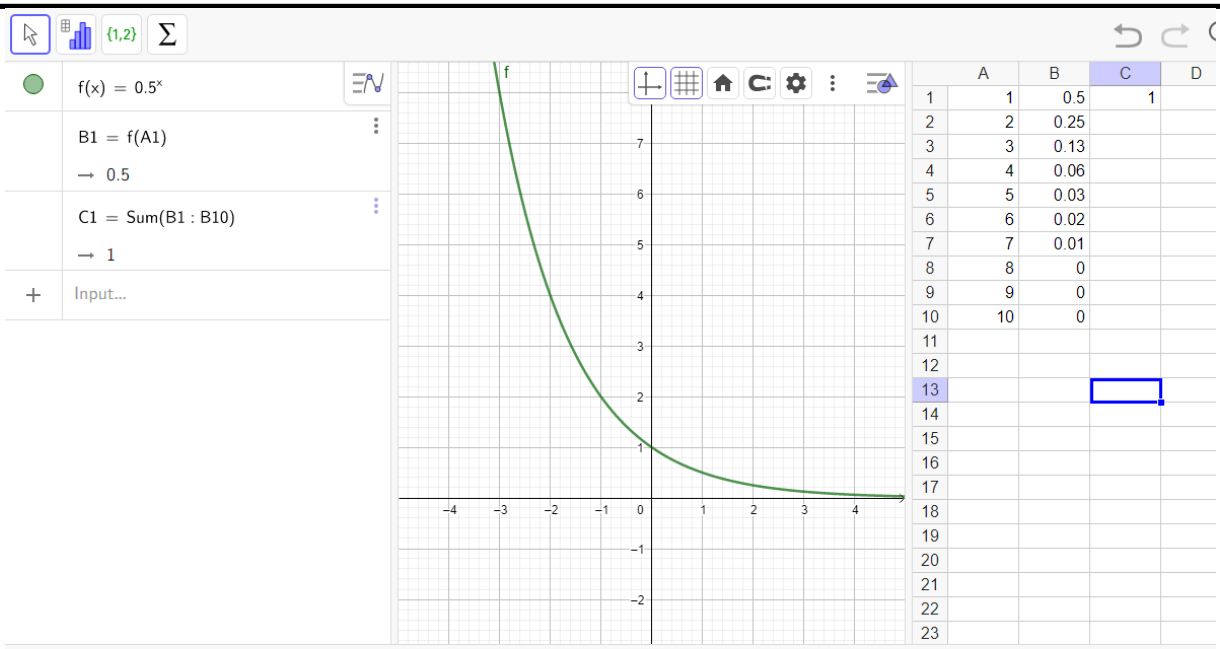
16. What is the sum ? The sum converges to 1.

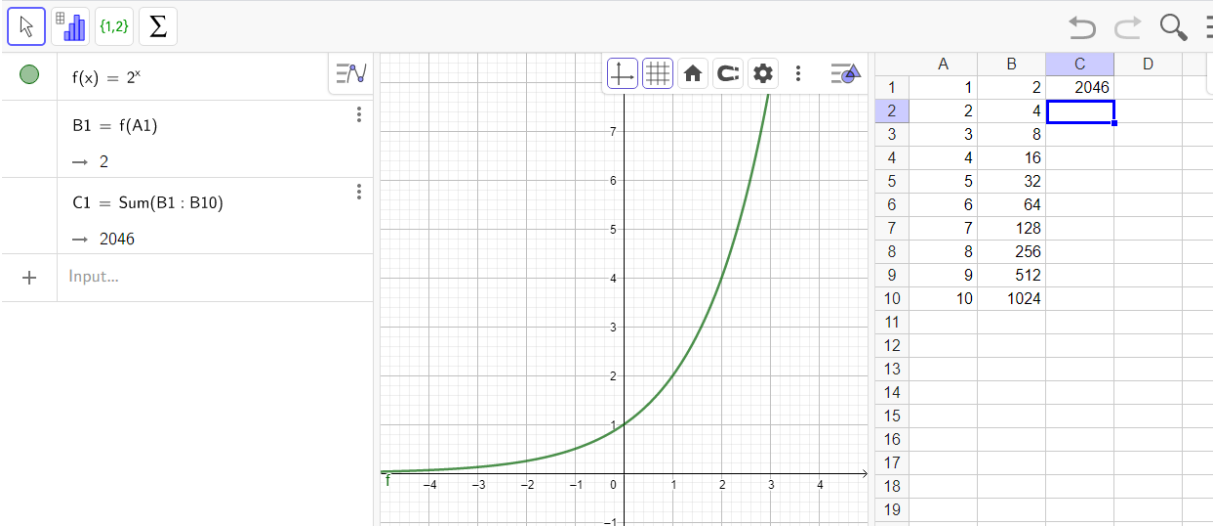
17. If you were to increase the number of terms to infinity what would happen to r^n if r is 0.5? It would tend to zero.

18. What would be the sum to infinity if 0< r<1? S=a/(1-r)

19. What would the sum be if r<0? If you make sure that -1<r<1 why does the sum to infinity formula still work? r^infinity would tend to zero

20. Explain what happens when r<-1. The sequence alternates between a negative number and a positive number and does not converge.


f(x) = 0.5^x
B1 = f(A1)
→ 0.5
C1 = Sum(B1 : B10)
→ 1
Input...
f
A B C D
1 1 0.5 1
2 2 0.25
3 3 0.13
4 4 0.06
5 5 0.03
6 6 0.02
7 7 0.01
8 8 0
9 9 0
10 10 0


f(x) = 2^x
B1 = f(A1)
→ 2
C1 = Sum(B1 : B10)
→ 2046
Input...
f
A B C D
1 1 2 2046
2 2 4
3 3 8
4 4 16
5 5 32
6 6 64
7 7 128
8 8 256
9 9 512
10 10 1024

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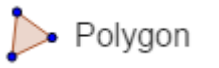
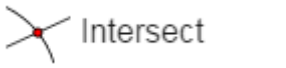
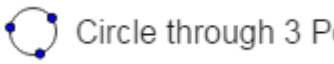
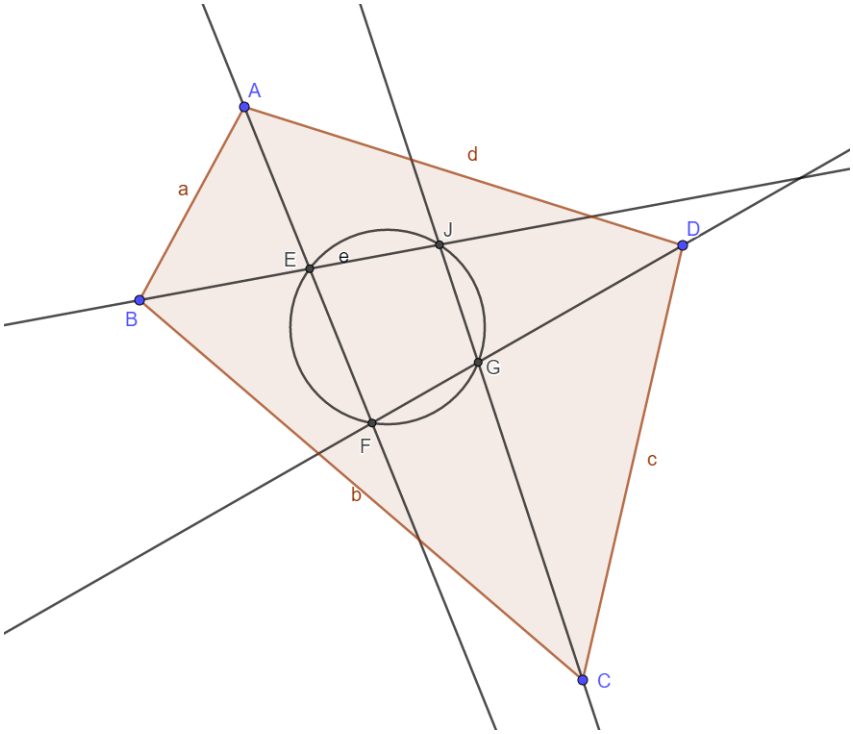
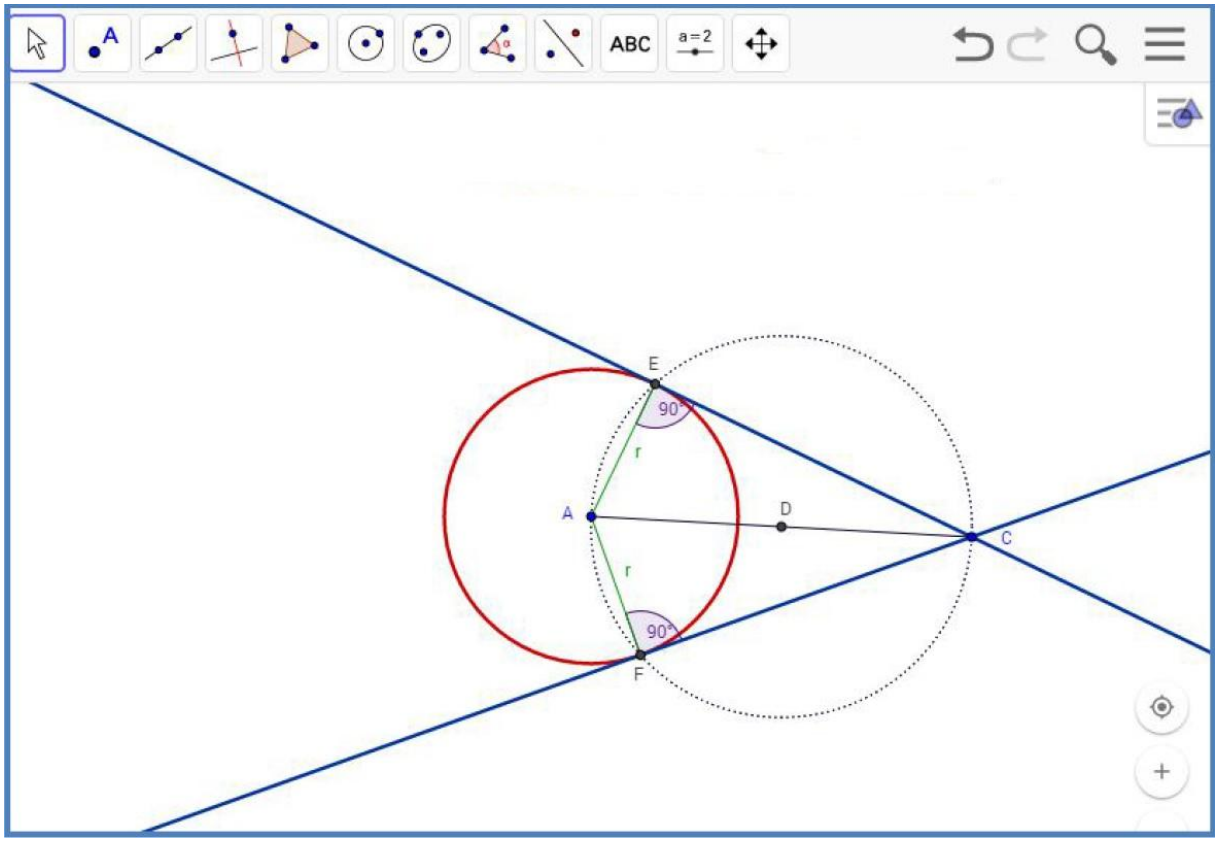
THE BISECTORS OF ANY QUADRILATERAL FORM A QUADRILATERAL INSCRIBED IN A CIRCLE

MENU	TOOL	PROCESS STEPS
		**Draw a random quadrilateral ABCD**
		**Construct angle bisector lines from vertex A,B,C and D**
		**Mark the intersections of every two angle bisector lineswith letters E,F,G,J**
		**Click on any 3 vertex of the quadrilateral EFGJ and see that it is inscribed in a circle.**

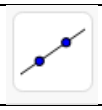


Tangents to a circle construction



- Open a new GeoGebra file
- Hide axes and grid
- Change the setting of the Objects label (choose Labelling from the menu Options, and then Only New Points).
- Follow the steps:

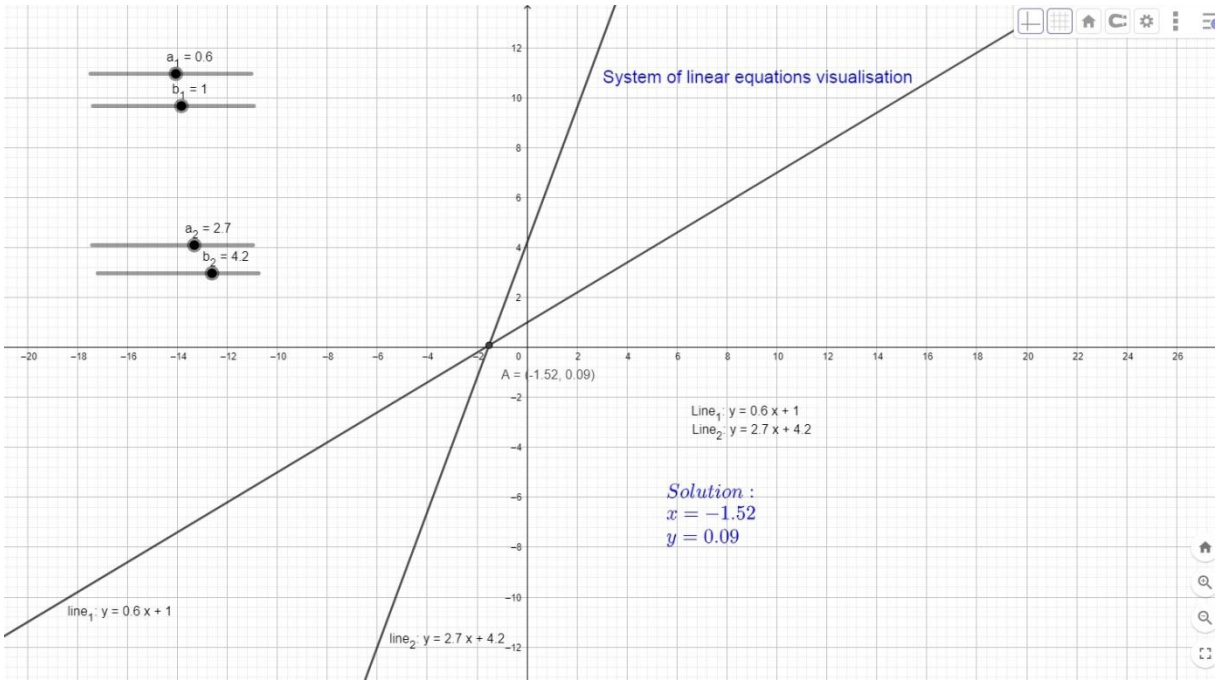
No	TOOL	PROCESS STEPS
1.		Choose the tool *Circle with centre through point*, draw a circle with A center passing through B point.
2.		Draw C point which is located outside the circle
3.		Using the tool *Segment* match the circle center A with a point C, segment *a* was created
4.		Find the center of segment *a*. Use the tool *Midpoint* or *Centre,* you will get point D.
5.		Construct a circle with centre at point D and passing through point C.
6.		Mark the intersection of both circles, points E and F were created.

7.		Using the tool *Line* draw two tangents to a circle: EC and FC
8.		Format the object
9.		Using the tool *Move* check if the construction was made correctly.

Additional activities

10.		To confirm that the lines are tangents to a circle, use the tool *Segment* and define the radius of the circle (join points A with E and A with F). Use *Caption* to have label **r** on both segments.
11.		Mark the angle between a tangent and a radius by clicking on verticles one by one clockwise (then marking will appear inside the angle)

System of linear equations visualisation



Create the applet, which will illustrate the system of linear equations visualisation.

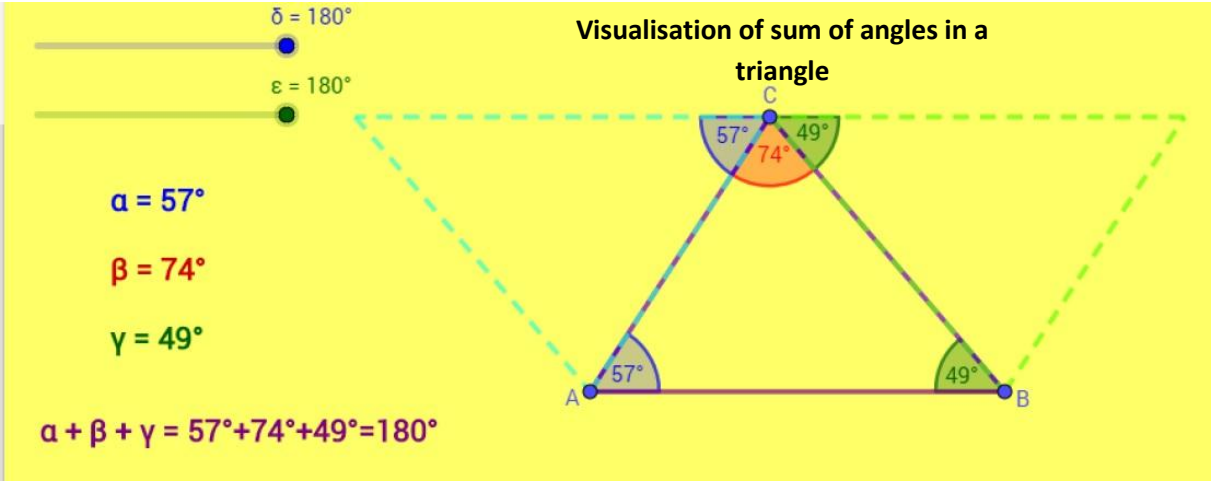
No	TOOL	PROCESS STEPS
1.	ABC	Insert text 1: *System of linear equations visualisation*
2.	a=2	Insert slider for **a_1** (a_1), interval between -10 and 10, increment 0.1.
3.	a=2	Insert slider for **b_1** number (b_1); interval between -10 and 10; increment 0.1.
4.		Show Input Bar (Menu – View – Input Bar). In the Input Bar (in the bottom under the graphics window) type in linear equation of **$line_1$:** *line_1: y=a_1x+b_1* line_1: y=a_1x+b_1
5.	a=2	Insert slider for **a_2** (a_2), interval between -10 and 10, increment 0.1.
6.	a=2	Insert slider for **b_2** number (b_2); interval between -10 and 10; increment 0.1.
7.		In the Input Bar type in linear equation of **$line_2$**

		line_2: y=a_2x+b_2. Click the right mouse button on $line_1$ and choose **Settings –** card **Basic – Show label: Name and Value (look point 4).**
8.		Insert dynamic texts showing the formula of Line 1 and Line2. 1. **Text 2**: Line_1: *line_1* 2. **Text 3** Line_2: *line_2* Attention!!! *line_1* an *line_2* choose from the scroll list Advanced
9.		Define the intersection of $line_1$ with $line_2$, using the tool *Intersect* and clicking on the first and then the second line. Point A will appear in the intersection (Show the label Name and Value).
10		Insert dynamic text 4: Solution: x=*x(A)* (x(A) defines coordinate x of point A) y=*y(A)* (y(A) defines coordinate y of point A) **ATTENTION!!!** In case of texts *x(A)* and *y(A)* use *empty formula box* from the scroll list *Advanced.* Type in everything in one line and in the end seperate the texts using Enter.
11.		Format the texts. Here are a few ways of formatting objects: 1) Click on the object you want to format with a left mouse button, a shortcut bar which you can use to format will appear. 2) Click on the object with a right mouse button, choosing *Settings* and appropriate tab from the context menu. The text can be bold, its size and font can be changed.

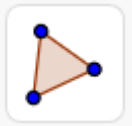
Tips:

- Show the label Name and Value for $line_1$ and $line_2$.
- Change the colours of $line_1$ and $line_2$.
- Adjust text colour to $line_1$ and $line_2$.
- After placing texts, place it choosing right mouse button and clicking on the text Fix Object.
- If you use LaTeX Formula and you want to insert Enter in the text use: \\, whereas for Space use: \.
- Scroll the slider observing how the solution of coordinate system and its lines are changing

Sum of angles in the triangle visualisation

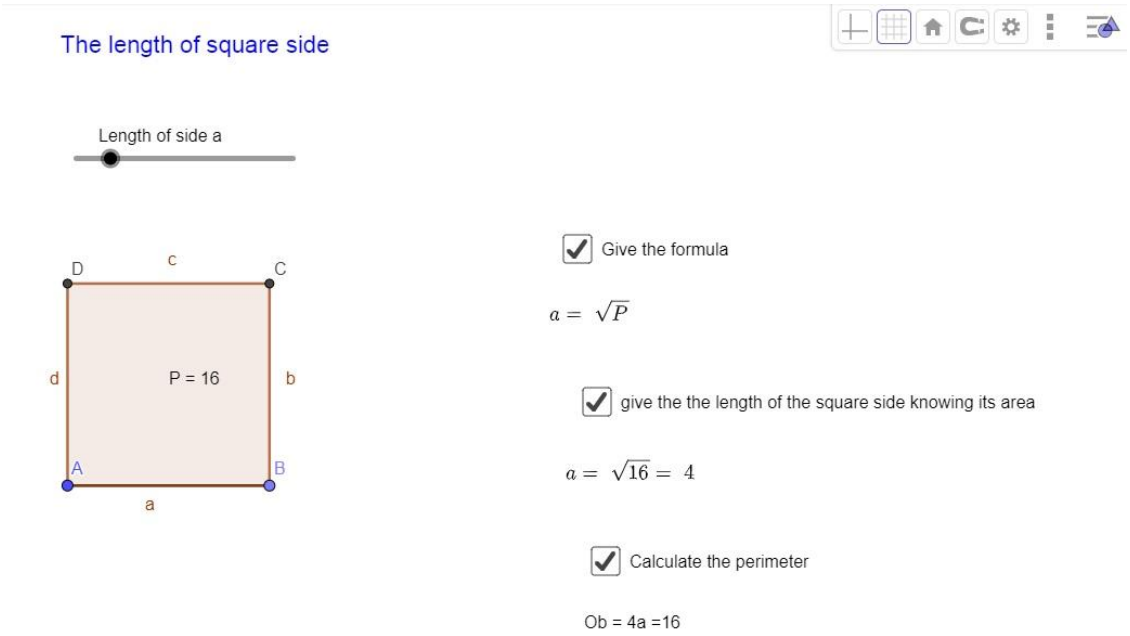


- Set the decimal place to 0 (Menu – Options – Rounding)

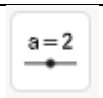
No	TOOL	PROCESS STEPS
1.	ABC	Insert text: Sum of angles in the triangle
2.		Draw a triangle ABC, using the tool *Polygon*
3.		Define internal angles of the triangle α, β,γ, using the tool *Angle* and choosing appropriate vertices BAC, ACB, CBA. Show the value of the angles.
4.		Create a slider for angle δ MIN 0°MAX 180° increment 10°
5.		Create a slider for angle **ε** MIN 0°MAX 180° increment 10°
6.		Using the tool *Midpoint*, find the midpoint D of segment AC and the midpoint E of segment CB.
7.		Using the tool *Rotate around point*, rotate the triangle choosing ABC triangle (clicking in the center of the triangle), then midpoint D and give δ angle [counterclockwise]
8.		Rotate the triangle ABC around E point by ε angle [counterclockwise]
9.		Set the δ and ε angle sliders to (for example) 140
10		Create ζ angle choosing points B'A'C' and η angle choosing C'_1,B'_1,A'_1 Choose Angle settings: Show label – Value.
11.		Hide all the points except A, B, C opening Algebra View and

		clicking on particular object.
12.		Turn off concave angle by clicking on the object with the right mouse button, choosing from the context menu Settings – Basic – Angle between 0^{o} and 180^{o}.
13.		Insert dynamic text showing the value of internal angles, eg. typing in the window Editing α = α (α choose from the scroll list Symbols αβγ, whereas α choose from the scroll list Objects) Do the same with the β and γ angles.
14.		Type in Input Bar: sum= α+β+γ to calculate the sum of angles in the triangle.
15.		Insert dynamic text showing the angle sum typing in the box Editing. α+β+γ = α+β+γ=sum (sum, α,β,γ choose from the scroll list Objects , whereas α,β,γ from the scroll list Symbols).
16.		• Format the objects and place the texts, • *a* and *b* slider – change the colour to the same as rotated triangle, • Adjust the colours of the texts with the value of angles to the angles in triangle, • Change the sliders values and observe the impact on the angles placement.

The lenght of square side



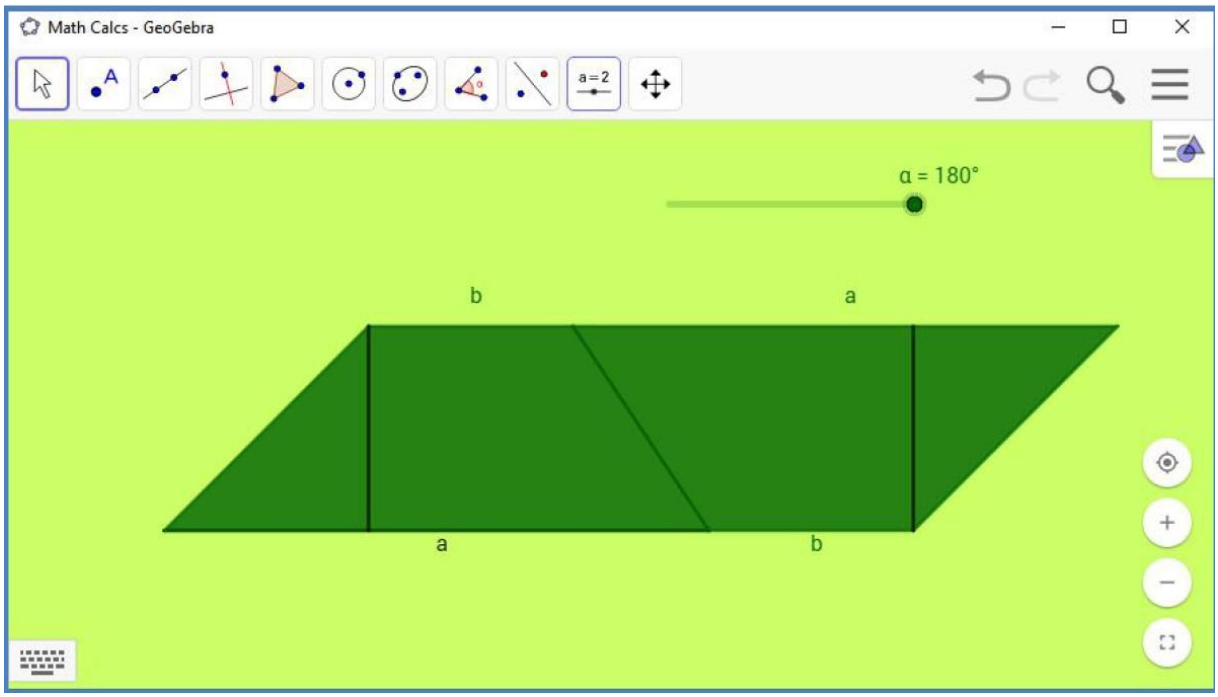
- Turn on the grid and Input bar

No	TOOL	PROCESS STEPS
1.	ABC	Insert text: The length of square side
2.		Insert slider *a*, interval between 1 and 20. Enter Slider Settings – Basic card and in *Caption* box type in: *the length of side a* and change the option Show label into *Caption*.
3.		Draw a segment from point A with length *a*.
4.		Draw a circle with the centre B and radius *a*.
5.		Draw a perpendicular line to AB passing through point B
6.		Define the intersection of circle and line using the *Intersect* tool; point C will be created
7.		Draw a parallel line to AB passing through point C

8.		Draw a perpendicular line to AB that pass through point A
9.		Define the intersection of both lines – point D; this way all the polygon vertices were defined
10.		Using the *Polygon* tool draw a square ABCD
11.		In the input bar type in P=a^2  Set up a slider value to 4 (to make square area bigger). Hide unnecessary objects.
12.		Insert text P=P and move it into figure area. Attention! Choose P from the scroll list Advanced-Objects  Attention! To see the text defining the area value inside the polygon choose *Midpoint* tool  and click on B and D points (point E will be created). Enter the Settings of the text P=P and in the *Position* tab choose point E as your Starting Point.
13.		Insert text $a = \sqrt{P}$ Tip: Advanced – LaTeX Formula, choose $\sqrt{x}$, change x into P.
14.		Using the tool *Check Box to Show/Hide objects* join the option box with appropriate text (In the Caption box type in: *Give the formula*; then choose appropriate text - $a = \sqrt{P}$).
15.		Insert dynamic text: $a = \sqrt{P} = a$ (P and a choose from Objects , whereas square root ($\sqrt{x}$) from LaTeX Formula
16.		Using the tool *Check Box to Show/Hide objects* join the option box with appropriate text (In the Caption box type in: *give the the length of the square side knowing its area* then choose *text4*).
17.		In the Input bar type in: Ob=4a and click Enter

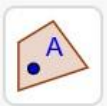
18.		Insert dynamic text: Ob.=4a=Ob.
19.		Using the tool *Check Box to Show/Hide objects* join the option box with appropriate text (In the Caption box type in: *calculate the square perimeter* then choose *text5*).
20.		Format texts and objects.

Trapeze area visualisation



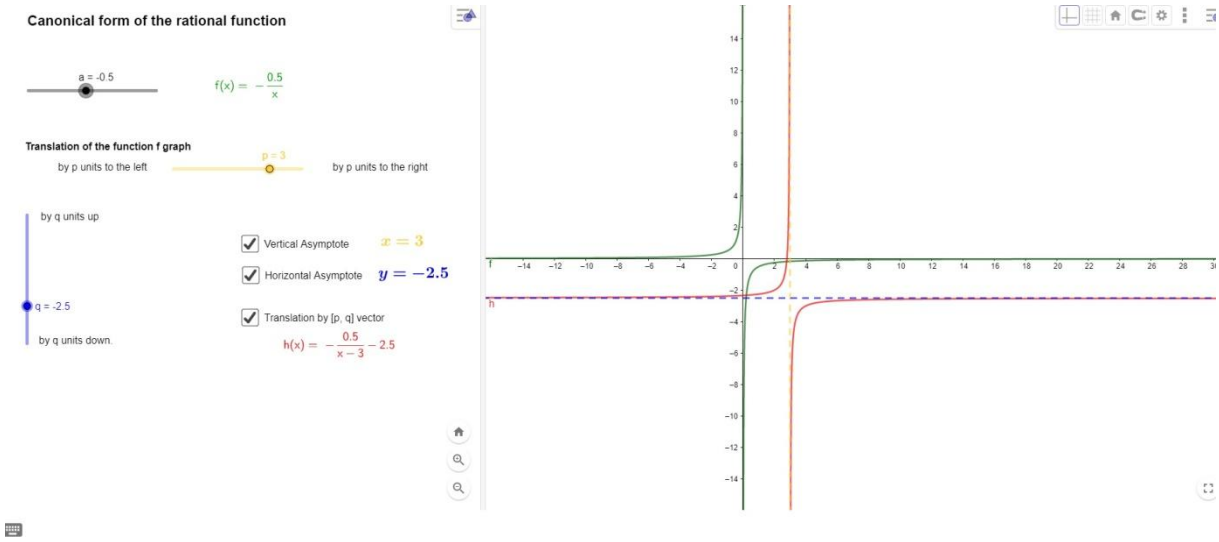
Create the applet to illustrate trapeze area

- Open a New Geogebra file
- Hide axes and grid
- Change the setting of the Objects label (choose Labelling from the menu Options, and then Only New Points).
- Follow the steps:

No	TOOL	PROCESS STEPS
1.		Using Segment tool construct AB segment.
2.		Insert point C that isn't collinear with points A and B.
3.		Using *Paraller Line* tool draw a parallel line to AB passing through point C
4.		Use the *Point on the object* tool and mark point D on the created parallel line.
5.		Construct trapeze ABCD
6.		Fix points A, B, C, D – click on the right mouse button, choose Settings and in tab Basic mark Fix Object

7.		Draw a perpendicular line to the line containing AB segment passing through vertex C
8.		Define the intersection point of created perpendicular line and segment AB. Point E will be created.
9.		Hide the parallel to AB line and the line containing its height (right button on the mouse, uncheck Show object).
10.		Draw segment CE, which will be the trapeze height
11.		Define the midpoint of the trapeze BD side. Point F will be created.
12.		Create a slider for angle α MIN 0°MAX 180° Increment 1°
13.		Using the tool *Rotate around point*, rotate the trapeze ABCD and its height to α angle around point F. To do it, click on the trapeze and then point F. **Remember insert α in Angle Box.** Hide the labels of all the points.
14.		Set the same labels to all corresponding trapezoidal bases Use *Caption* box.

Canonical form of the rational function – combo box



Instruction:

1. Turn the Algebra View off
2. Turn the Graphic View and Graphic View 2 on
3. Hide the axes in the Graphic View

ABC	Activate the Graphic View. Insert the static text that is a name of our construction, e.g. Canonic form of the rational function.
a = 2	Insert the slider a – values: -5 to 5, 0.1 increment
	Activate the Graphic View 2 and key y = a/x in the input bar. A graph of the function appears dependent on the factor a. Attn: you can always edit the object location – click the particular object, choose the Advanced tab, then Location (tick or uncheck the right View).
ABC	Insert the text: h(x) = f Choose f in the object list, activate the LaTex formula. Edit its features in the Advanced tab, key a≠0 as the Condition of the object displaying.
ABC	Insert the text: That is not a rational function. Edit its features in the Advanced tab, as the Condition of the object displaying key a=0 in, set it the same place as the text displaying the function formula.
a = 2	Insert the p slider, values: -6 to 6, 0.5 increment. Set the yellow colour. Match the slider location and the texts.

	Insert the text: Translation the graph of the function f.
	Insert the text: by p units to the left. Insert the text: by p units to the right. Set them adequately from left and right side of the slider p.
	Insert the vertical slider q (in the Slider tab choose the vertical one), values: -6 -6, 0.5 step. Change its colour blue and match the slider location and the texts.
	Insert the text: by q units up. Insert the text: by q units down. Set them adequately above and below the slider q.
	Activate the Graphic View 2, then key asymptote equation in the input bar. - vertical: x=p, set it yellow, style of the straight line – dashed - horizontal: y=q, set it blue, style of the straight line – dashed
	Activate the Graphic View 2, then key y = a/(x-p) + q in the input bar. The graph of the function appears that is translated by [p, q] vector. Change its colour red, set the style of the straight line 5.
	In the Graphic View insert the text: x= p, choose p in the object list. Change its colour yellow, tick the LaTex formula.
	In the Graphic View insert the text: y= q, choose q in the object list. Change its colour blue.
	Insert the combo box in the Graphic View. As the Caption insert the text: Vertical Asymptote, then from the list Choose object from the construction or choose from the list Indicate x=p
	Insert the combo box in the Graphic View. As the Caption insert the text: Horizontal Asymptote, then from the list Choose object from the construction or choose from the list Indicate y=q
	Insert the combo box in the Graphic View. As the Caption insert the text: Translation by [p, q] vector, then from the list Choose object from the construction or choose from the list Indicate y = a/(x-p) + q
	Polish the construction in terms of aesthetics, fix the objects.

Dispalying the sum of the triangle angles, its area and perimeter

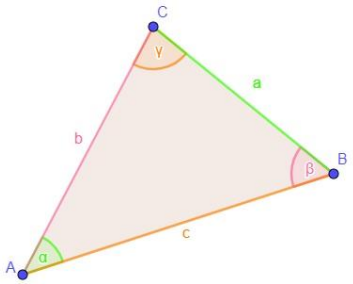
Instruction:

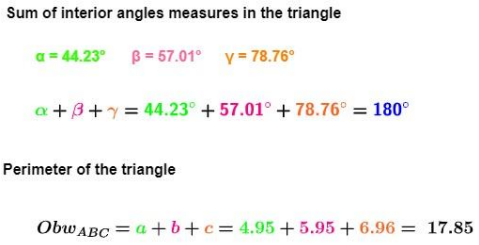
Open the Graphic View window

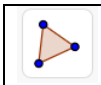
- in Options change Labelling to New Points Only. Type size: 16.

- Hide the Axes and Grid.

The expected effect of the construction:

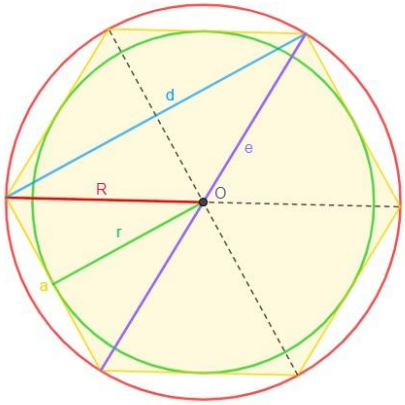




	Draw a triangle ABC.
	Show the side labels of triangle (after choosing the tool, click: triangle sides) or click RMB on the particular side and choose the option: Show a label.
	Draw interior angles of triangle. Edit their features, click RMB and in the Basic tab tick an option: angle between 0° and 180°
	Turn the Graphic View 2 on.
	In the Graphic View 2, insert the text 1: Sum of interior angles measures in the triangle.
	In the Graphic View 2, insert the next three dynamic texts that will display measures of the particular angles.

	Choose Greek lettering from the Symbol tab, whereas the angle from the Object  tab. Change the colour of the particular text corresponding to its angle, e.g. α – olive, β – sky-blue, γ – red.
	Activate the Input bar.
	Key: α + β + γ in the input bar. Instructions: symbols of Greek alphabet are to the right of the input bar. In the Algebra View there will be number δ equal to the sum of interior angles measures in the triangle.
	You can key the extract of the text in different colours. Tick the LaTex option and insert the following formula: \textcolour{colour name}{the right extract of the text}
	Insert the colourful dynamic text in the Graphic View 2.
	In the Graphic View 2, insert the text: Perimeter of the triangle.
	Insert the colourful dynamic text in the Graphic View 2.
	In the Graphic View 2, insert the text: Area of the triangle = polygon1 Choose the polygon1 from the Object window.

Regular Hexagon



☑ Regular hexagon with the side a

each regular hexagon can be divided into 6 equilateral triangles with the side length a

☑ : A circle circumscribed about a regular hexagon with the side a

R = a

☑ An inscribed circle of a regular hexagon with the side a

$$r = \frac{a\sqrt{3}}{2}$$

☑ A shorter diagonal

$$d = 2r = 2 \cdot \frac{a\sqrt{3}}{2} = a\sqrt{3}$$

☑ A longer diagonal

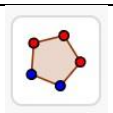
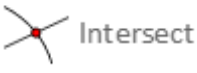
e = 2R = 2a

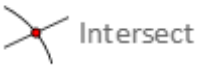
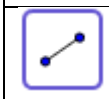
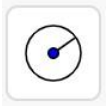
`

Initial activities:

- Menu – Options – Labelling tick: All new objects

Instruction:

	Draw a regular hexagon. After ticking two vertices of the polygon, e.g. A, B in the query window key the number of sides that is 6. Edit its features. In the Style tab set Thickness of the straight line 5, in the Colour tab set it yellow and set the Transparency 0.
	Draw a circle going through the points A, B, C. Edit its features. In the Style tab set Thickness of the straight line 5, in the Colour tab set it red.
	Draw diagonals of the hexagon that is AD, BE and CF segments. Edit its features, change the Style of the line – dashed.
	Define the intersection point G, change its name into O.
	Draw the segment AO. It is a circumradius. Edit its features in the Basic tab: as Caption key R, choose as Show a Label: Caption. In the Style tab, set Thickness of the straight line 5, in the Colour tab set it red.
	Draw a line p that is perpendicular to AB segment and crossing the point O.

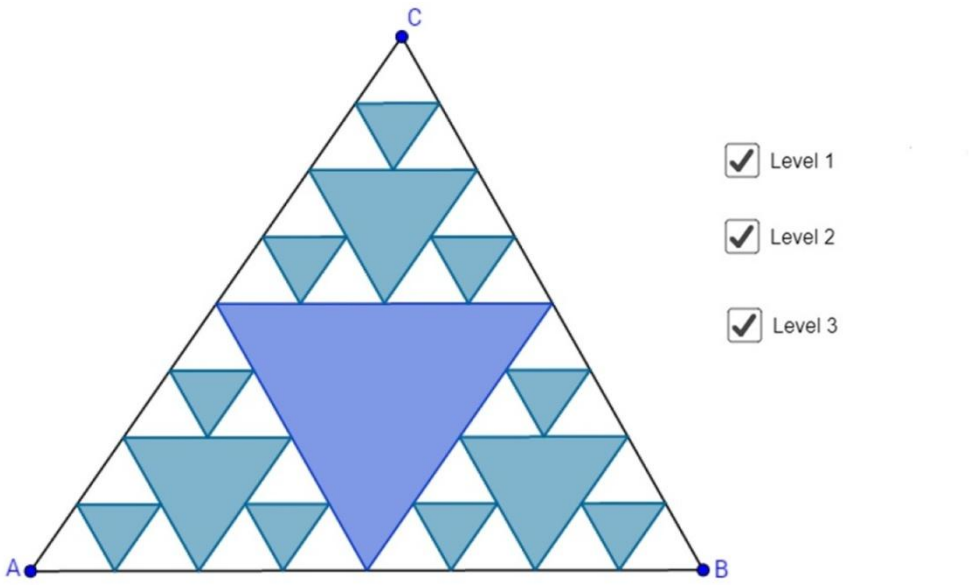
	Define the point G that formed with intersection of line p and side AB.
	Draw the segment OG, it is an inradius. Edit its feautures, in the Basic tab: as Caption key r, choose as Show a Label: Caption. In the Style tab, set Thickness of the straight line 5, in the Colour tab set it green.
	Draw an inscribed circle of a hexagon that is a circle with the center point O and the radius r. Edit its features, in the Style tab set Thickness of the straight line 5, in the Colour tab set it green.
	Draw a segment that is a shorter diagonal of the hexagon. Edit its features, in the Style tab set Thickness of the straight line 5, in the Colour tab set it blue, as Caption key d , tick the Show a Caption option in the Basic tab.
	Draw a segment that is a longer diagonal of the hexagon. It will cover with one of the earlier drawn segments. Edit its features, in the Style tab set Thickness of the straight line 5, in the Colour tab set it purple, as Caption key e , tick the Show a Caption option in the Basic tab.
	Draw a segment AB that is a side of the hexagon.
	Hide the straight line p.
	Hide all unnecessary labels and objects.

Insetting of the combo box

	Insert the text: each regular hexagon can be divided into 6 equilateral triangles with the side length a.
	Insert a combo box Show/ Hide an object with Caption: Regular hexagon with the side a. Tick in the construction or choose objects from the list: Hexagon, its sides and its longer diagonals and their intersection point.
	Insert the text: R = a. Set its colour red, choose the embolden option.
	Insert a combo box Show/ Hide an object with Caption: A circle circumscribed about a regular hexagon with the side a. Tick in the construction or choose objects from the list: Circle C, segment R and previously added text.
	Insert the text using the LaTex option. The green colour, embolded.

	Insert a combo box Show/ Hide an object with Caption: An inscribed circle of a regular hexagon with the side a. Define objects: a corresponding circle, its radius r and previously added text.
	Insert the text using the LaTex option. The blue colour, embolded.
	Insert a combo box Show/ Hide an object with Caption: A shorter diagonal, Marked objects: A shorter diagonal and previously added text.
	Insert the text: e = 2R = 2a The purple colour, embolded.
	Insert a combo box Show/ Hide an object with Caption: A longer diagonal, Marked objects: A longer diagonal and previously added text.
	Polish the construction in terms of aesthetics.

Sierpinski Triangle

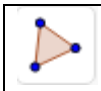
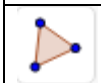


Initial activities:

- Hide the Grid and Axes of the coordinate system

- Set Labelling – New Points Only

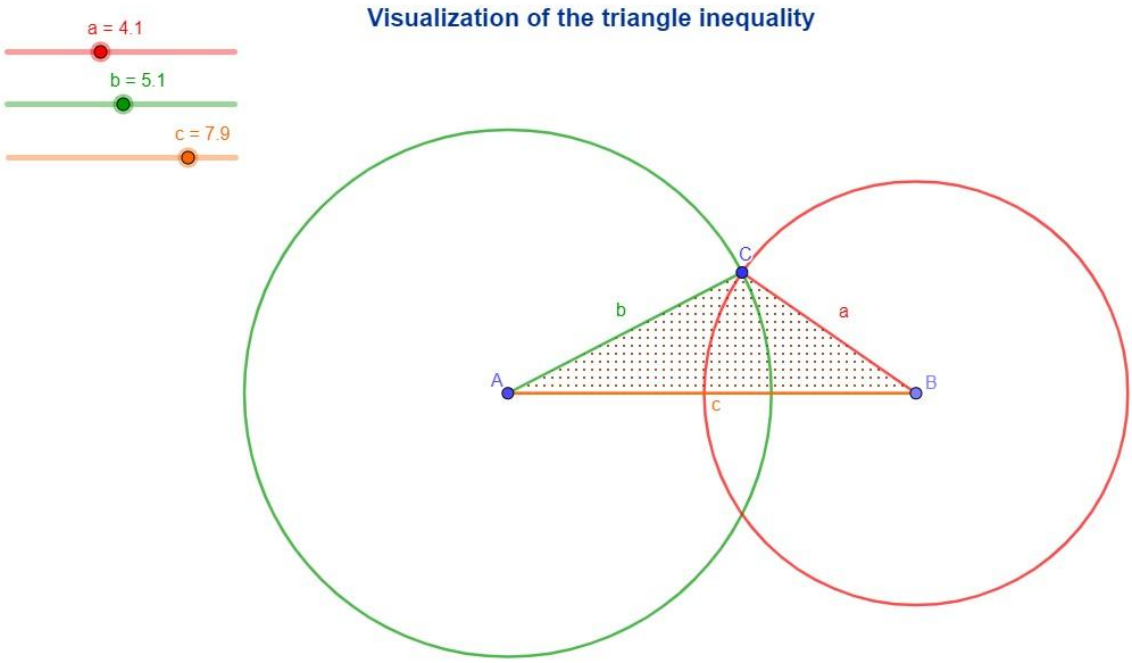
Instruction:

	Construct a triangle ABC. Edit its features. In the Colour tab set the black one, decrease Transparency to 0.
	Define the point D – the centre of triangle side AB Define the point E – the centre of triangle side BC Define the point F – the centre of triangle side AC
	Draw a triangle DEF. Edit its features. In the Colour tab set the blue one, decrease Transparency to 50%.
	Create a new tool named Sierpinski. Output objects: points D, E, F, triangle DEF, sides of triangle DEF. Input objects: pints A, B, C. Name: Sierpinski Instructions: Click three noncollinear points.
	Use the tool to three blue triangles: ADF, DBE and FEC to create the second level of Sierpinski Triangle.

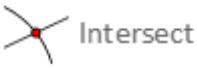
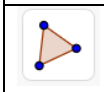
	Use the tool to previously created triangles to form the third level of Sierpinski Triangle.
	Hide all the points except for A, B, C.
	Insert the combo box Show/Hide Object with Caption – Level 1. Choose appropriate objects from the triangle construction and its sides. Insert the next two combo boxes likewise – Level 2 and Level 3.

Visualization of the triangle inequality

The expected effect of the activities below:



	Hide the Algebra View, Axes and Grid in the Graphic View, Labelling – new points only.
	Display the Navigation bar of steps at the bottom of the Graphic View. Choose the Navigation bar from the context menu in the Graphic View (RMB in the Graphic View window).
ABC	Insert the text: Triangle construction from three segments.
a = 2	Insert sliders a, b, c corresponding to the length of triangle sides. Slider range: 0…10, 0.1 step.
a	Insert the segment with the starting point A and length c.
	Insert circles: with the center point A and radius b, and with the center point B and radius a.

	Define the point C – intersection of the circles.
	Draw a triangle ABC.
	Match the colours corresponding to particular objects, e.g. slider a, segment a and circle with radius a – red; slider b, segment b and circle with radius b – blue; slider c and segment with the length of c – green.
	Turn labels of triangle sides on as their Captions. (Two objects cannot have the same name – if the slider is named a, the segment can only have the label named a – not the name a).
	Using the Navigation bar at the bottom of the window, play the construction step by step. Try the AutoPlay.