EUROGEBRA WORKSHEETS

Plane geometry II

EUROGEBRA WORKSHEETS

TITLE: PLANE GEOMETRY

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.

EUROGEBRA WORKSHEET

CENTER OF CIRCLE

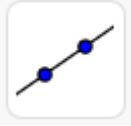
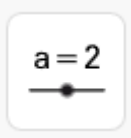
FIND THE CENTER OF CIRCLE

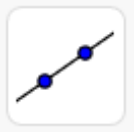
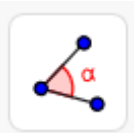
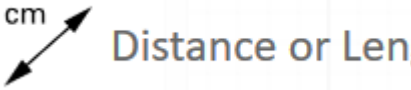
MENU	TOOL	PROCESS STEPS
	 Circle through 3 Points	**Draw circle that through A,B,C points**
	 Segment	**Combine the A and B points**
	 Compass	**Draw a circle that radius equal to length of AB segment and centered at C**
	 Intersect	**Define the points that formed with intersections of circles(D point)**
	 Segment	**Combine the C and D points**
	 Perpendicular Bisector	**Draw perpendicular bisectors of AB and CD segments**
	 Intersect	**Define the points that formed with intersections of perpendicular bisectors (Center of circle)**
	 Distance or Length	**Measure from center point to a point which is on the circle**

EUROGEBRA WORKSHEET

DIVIDING A SEGMENT

Dividing a segment into 3 pieces of equal length

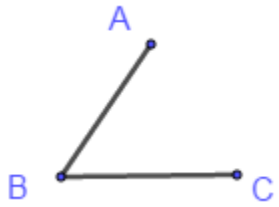
MENU	TOOL	PROCESS STEPS
		Draw [AB] line segment
		Draw a ray starting in A
		Create a slider *a*=1 MIN 1 MAX 10 INTERCEPT 0.1
		Draw a circle with radius *a* and a center at A
		Find the intersection of the circle with the ray. Mark it as point D
		Draw a circle with radius *a* and a center at D.
		Find the intersection of the circle with the ray. Mark it as point E
		Draw a circle with radius *a* and a center at E.

		Find the intersection of the circle and the ray. Mark it as point F.
		Create a line through points F and B
		Draw lines parallel to the one from the previous step, that go through points E and D respectively
		Find the intersections of these lines with segment AB. Mark them as I and J.
		Drew segments [AI], [IJ] and [JB]
		Check the length of these segments

EUROGEBRA WORKSHEET

EQUAL ANGLE

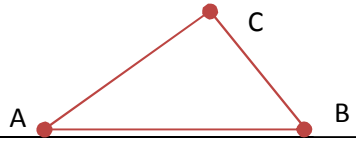
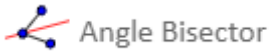
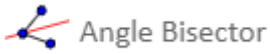
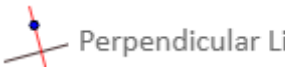
DRAW AN ANGLE EQUAL TO THE GIVEN ANGLE

MENU	TOOL	PROCESS STEPS
		
	 Circle with Centre through Point	**Draw the circle with the center point B and cutting the segments at two points.**
	 Intersect	**Define the points that formed with intersection of circle and line with the intersection tool (E and F points)**
	 Line	**Draw a new line (GH line)**
	 Compasses	**Drawa circle with radiusequal to length BEand center it at G**
	 Intersect	**Define the point that formed with intersection of circle and line with the intersection tool (I point)**
	 Compasses	**Drawa circle with radiusequal to lengthEFand center it at I**
	 Intersect	**Define the points that formed with intersection of circles (J point)**

		**Connect G and J points with the "Segment" tool.**
		**Check the angles CBA and IGJ**

EUROGEBRA WORKSHEET

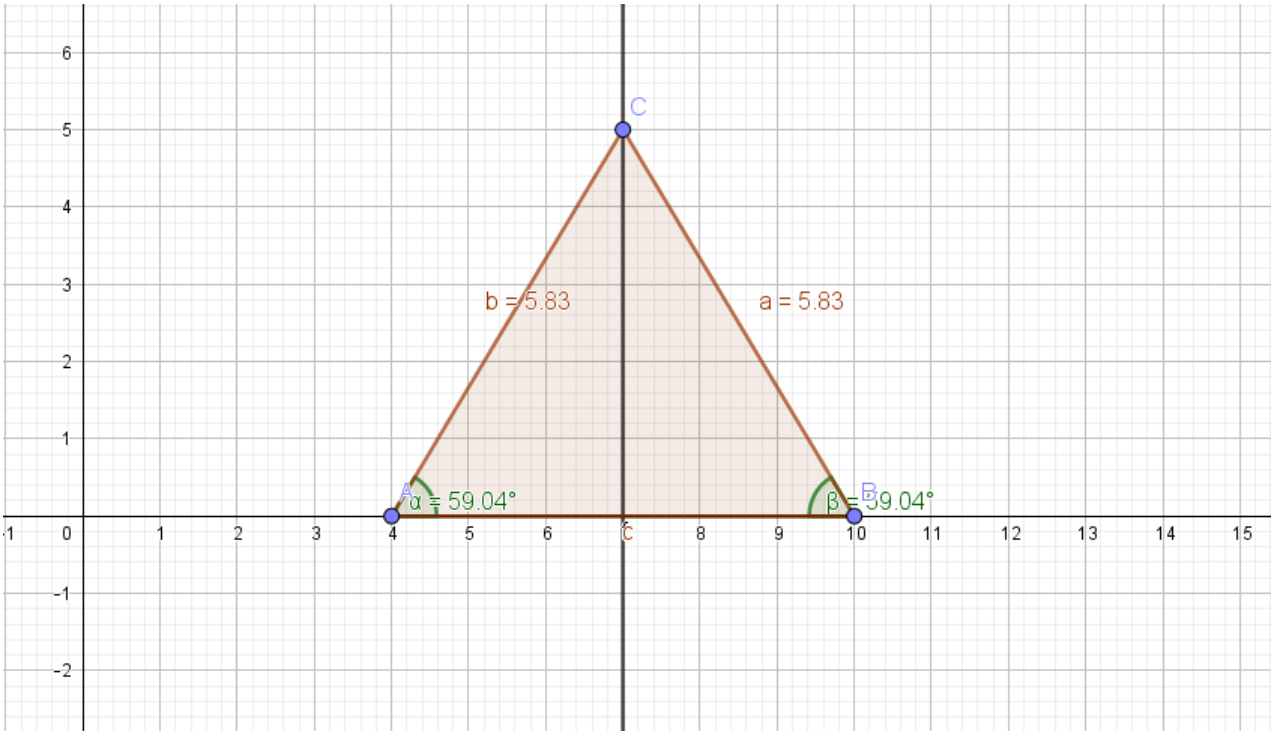
FIND THE INCENTRE AND THE INSCRIBED CIRCLE OF A TRIANGLE

MENU	TOOL	PROCESS STEPS
		
		**Constructthe angle bisector of angle BAC.**
		**Construct the angle bisector of angle ABC.**
		**Find the intersection of the two angle bisectors (point D). This is the incentre.**
		**Construct a line perpendicular to the line AB that goes through point D.**
		**Find the intersection of the perpendicular line and the line AB (point E).**
		**Construct a circle with centre at point D and radius DE. This is the inscribed circle.**

EUROGEBRA WORKSHEET

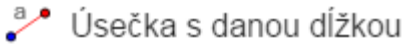
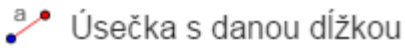
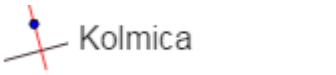
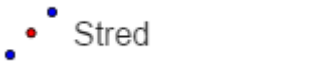
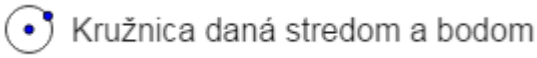
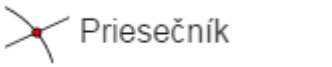
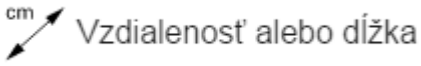
DRAW AN ISOSCELES TRIANGLE

MENU	TOOL	PROCESS STEPS
	 Segment	**Draw an arbitrary segment AB**
	 Perpendicular Bisector	**Draw perpendicular bisector of segment AB**
	 Point	**Define arbitrary point C on perpendicular bisector**
	 Segment	**Draw segments by selecting points A, C and B, C**
	 Polygon	**Select points A,B,C to draw triangle**
	 Distance or Length	**Check and compare lenght of segments AB and BC**
	 Angle	**Check and compare angles between segments AB, AC and BC, AB**
	 Move	**Move point C and watch changes. What can we say?**

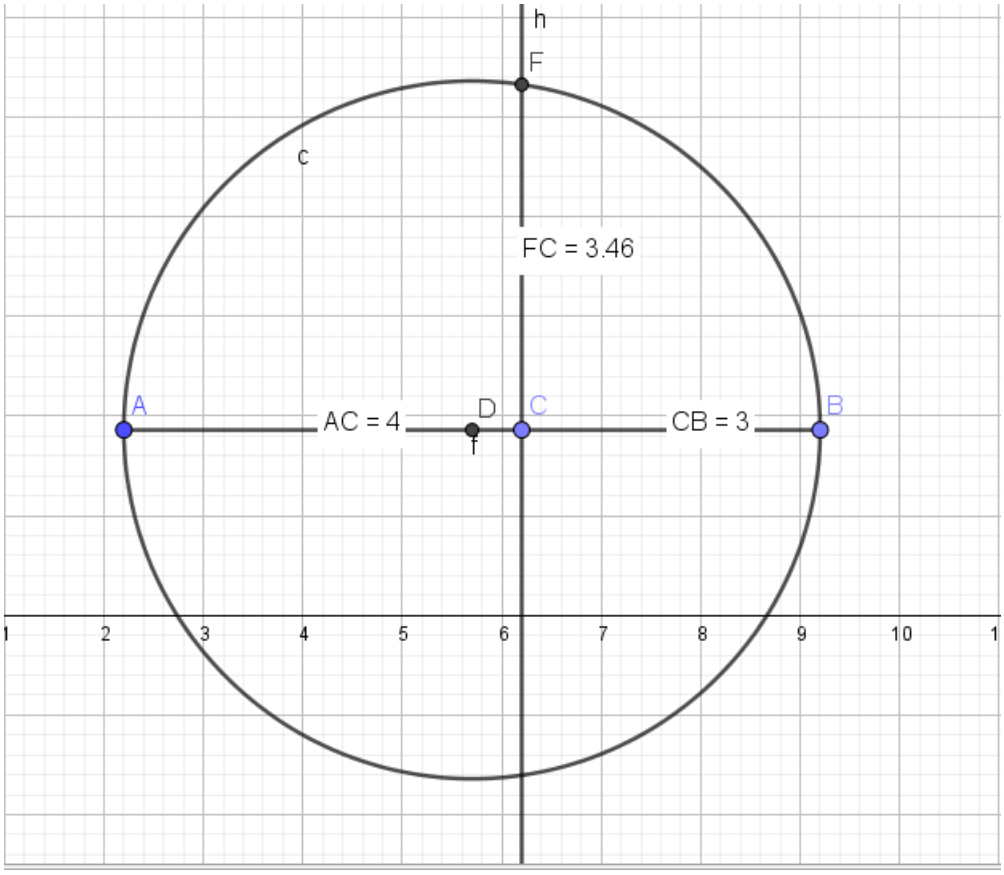

C
b = 5.83
a = 5.83
A
α = 59.04°
β = 59.04°
B
c

EUROGEBRA WORKSHEET

CONSTRUCT A LINE WITH LENGHT $\sqrt{12}$

MENU	TOOL	PROCESS STEPS
		We find two numbers whose product is 12 and whose length we can construct. For example, 4 and 3.
		Create a line A, B with a length of 7cm (4 + 3)
		Mark the point C on the line AB at a distance of 4 cm from the point A
		Make a perpendicular line to line AB in point C
		Locate the midpoint of the line AB - point D
		Make a circle with the center D and the radius DB, respectively DA
		Determine the intersection of the circle and the perpendicular to the line AB - point F
		Check the length of the FC line

The solution is based on Euclid's theorem of height: v2 = ca. cb
In this case (FC) 2 = AC.CB
h = √12 cm, ca = 4cm, cb = 3cm


h
F
c
FC = 3.46
A
AC = 4
D
C
CB = 3
B
f
1
2
3
4
5
6
7
8
9
10
1

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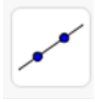
FIND THE MEDIAN POINT OF TRIANGLE

MENU	TOOL	PROCESS STEPS
	 Polygon	**Create an arbitrary triangle ABC**
	 Midpoint or Centre	**Determine the midpoint of segment AB – point D**
	 Segment	**Connect point D with opposed vertex C**
	 Midpoint or Centre	**Determine the midpoint of segment BC – point E**
	 Segment	**Connect point E with opposed vertex A.**
	 Intersect	**Determine intersection of segments AE and DC – point F.**
	 Distance or Length	**Compare the lengths of segments AF, FE and DF, FC. What´s their ratio?**
	 Move	**Move any vertex and watch the position of median point.**

EUROGEBRA WORKSHEET

MIDPOINT OF THE LINE

DRAWTHE MIDPOINT OF THE LINE SEGMENT

MENU	TOOL	PROCESS STEPS
	 Segment	**Draw [AB] line segment**
	 Circle with Centre through Point	**Draw two circles that with radius equal to length of AB and to is centered it at A and B**
	 Intersect	**Define the points that formed with intersection of circles with the intersection tool (C and D points)**
	 Segment	**Connect two points with the "Segment" tool.(C and D Points)**
	 Intersect	**Intersect two segment that named AB and CD. (E point)**
	 Distance or Length	**Check the length of [AE] and [EB] line segment**

EUROGEBRA WORKSHEET

PARALLEL LINE

CONSTRUCT A LINE PARALLEL TO THE GIVEN LINE GOING THROUGH POINT B

MENU	TOOL	PROCESS STEPS
		
	 Line	**ConnectA and C points with the "Line" tool.**
	 Circle with Centre through Point	**Draw a circle with the center it at A and cutting the line at two points.**
	 Intersect	**Define the points that formed with intersection of circle and lines (E and F points)**
	 Compasses	**Drawa circle with radius equal to length AEand center B**
	 Intersect	**Define the points that formed with intersection of circle and line with the intersect tool (G point)**
	 Compasses	**Construct a circle with radius equal to EFand center G**
	 Intersect	**Define the points that formed with intersection of circles that C and G-centered (H point)**

		**Connect C and H points with the "Line" tool.**

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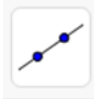
PERPENDICULAR BISECTOR

CONSTRUCT A PERPENDICULAR BISECTOR TO THE GIVEN LINE SEGMENT

MENU	TOOL	PROCESS STEPS
	 Segment	**Draw [AB] line segment**
	 Circle with Centre through Point	**Draw two circles with radius equal to length of AB and center it at A and B**
	 Intersect	**Define the points that formed with intersection of circles with the intersection tool (C and D points)**
	 Segment	**Connecttwo points with the "Segment" tool (C and D points)**
	 Intersect	**Define the point that formed with intersection of segmentsAB and CD (E point). This must be midpoint of AB segment.**
	 Distance or Length	**Check the length of AE and EB line segments**
	 Angle	**Check the angles AEC or BEC**

EUROGEBRA WORKSHEET

PERPENDICULAR LINE

DRAW A LINE (SEGMENT) THAT GOES THROUGH POINT A AND THAT IS PERPENDICULAR TO THE GIVEN LINE SEGMENT

MENU	TOOL	PROCESS STEPS
		**Draw a segment and mark arbitrary point A on it.**
		**Draw a circle that with of any radius and with center it at A**
		**Define the points that formed with intersection of circle and line with the intersection tool (E and D points)**
		**Draw a circle that center it at D with radius is bigger than length of AE**
		**Draw a circle that E centered radius is equal to the radius of the D centered circle**
		**Define the points that formed with intersection of circles that is centered it at E and D with the intersection tool (H and G points)**
		**ConnectH and G points with the "Segment" tool.**
		**Check the angle DAH or HAE**

EUROGEBRA WORKSHEET

QUADRILATERAL

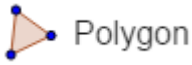
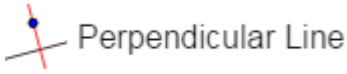
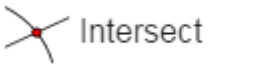
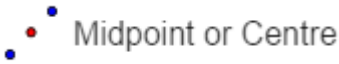
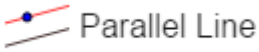
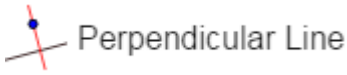
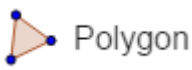
Form a quadrilateral to a rectangular

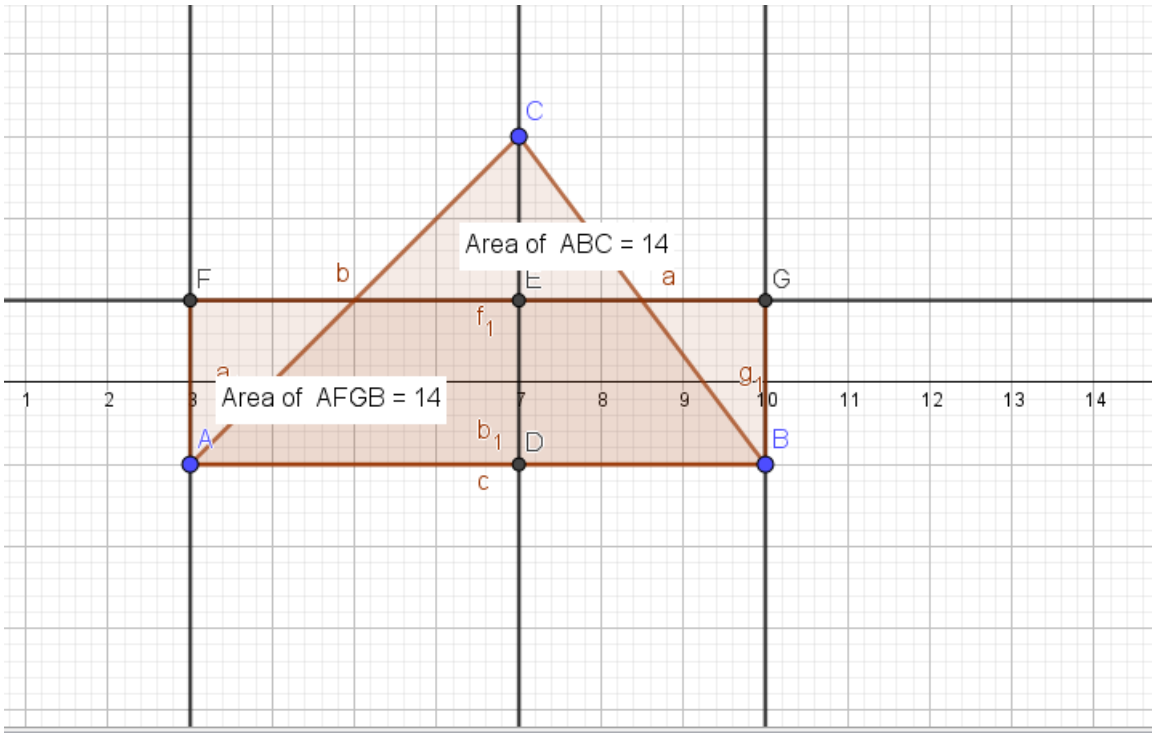
MENU	TOOL	PROCESS STEPS
	 Polygon	**Draw a randomquadrilateral ABCD**
	 Midpoint or Centre	**Draw the midpoint of the segments AB,BC,CD and DE(Points E,F,G and H)**
	 Segment	**Draw the segments EF,FG,GH and HE**
	 Segment	**Draw the segments AC and BD**
	 Intersect	**Find the intersection point I of the segments AC and BD**
	Question1: What kind of shape is the EFGH ?	
	 Angle	**Draw the angles DIA and EHG**

- **Question2: If the EFGH rectangular is a rectangle what would be the shape of the initial uadrilateral.**
- **Question3: If the EFGH rectangular is a square what would be the shape of the initial quadrilateral.**

EUROGEBRA WORKSHEET

DRAW A RECTANGLE WITH THE SAME AREA AS THE GIVEN TRIANGLE AREA

MENU	TOOL	PROCESS STEPS
		**Draw an arbitrary triangle ABC**
		**Construct perdpendicular line to segment AB from vertex C**
		**Mark the intersection of perpendicular line and segment AB – point D**
		**Find the midpoint of segment CD – point E**
		**Construct the parallel line „g“ through point E to segment AB**
		**Draw perpendicular lines from points A and B to paralel line „g“**
		**Mark intersections of those lines – points F and G**
		**Select vertices of rectangle A, B, G, F (then first vertex again)**
		**Compare areas of rectangle ABGF and triangle ABC**


C
Area of ABC = 14
F
b
E
a
G
f1
a
g1
Area of AFGB = 14
1
2
3
7
8
9
10
11
12
13
14
A
b1
D
B
c

EUROGEBRA WORKSHEET

CONSTRUCT A SQUARE WITH THE SAME AREA AS THE GIVEN RECTANGLE AREA

MENU	TOOL	PROCESS STEPS
		Construct an arbitrary rectangle „ABCD“
	 Ray	**Draw a rey on the segment „CD“**
	 Circle with Centre through Point	**Construct a circle with centre point „D“ through point „A“**
	 Intersect	**Define an intersect of the circle and ray „CD“ – point „E“**
	 Midpoint or Centre	**Define a midpoint of segment „EC“ – point „F“**
	 Semicircle through 2 Points	**Draw a semicircle with end points „E“ and „C“**
	 Ray	**Draw a rey on the segment „AD“**
	 Intersect	**Define an intersect of the ray AD and semicircle – point „G“**

	 Regular Polygon	**Select points „D“ and „G“ and draw regular polygon with 4 vertices – square „IDGH“**
	 Area	**Compare area of rectangle „ABCD“ and square „IDGH“**

EUROGEBRA WORKSHEET

SQUARE

CONSTRUCT A SQUARE

MENU	TOOL	PROCESS STEPS
	 Line	**Draw AB line**
	 Perpendicular Line	**Draw a perpendicular line thatgoes to A point to AB**
	 Circle with Centre and Radius	**Draw a circle that radius equal to length of AB segment and centered at A**
	 Intersect	**Define the points that formed with intersections of circle and lines**
	 Angle Bisector	**Draw angle bisectors of EAD and DAF angles**
	 Intersect	**Define the points that formed with intersections of circle and angle bisector lines**
	 Segment	**Combine the points that formed with intersected circle and angle bisectors**
	 Distance or Length	**Check the length GA and GB line segments**

EUROGEBRA WORKSHEET

TRIANGLE, LINE

Draw an equilateral triangle such that the segment ab is one of its sides

MENU	TOOL	PROCESS STEPS
	 Segment	**Draw AB line segment**
	 Circle with Centre through Point	**Draw two circles with radius equal to length AB and the centers must beA and B**
	 Intersect	**Define the points that formed with intersection of circles with the intersection tool. Give a name one of the intersections like C**
	 Polygon	**Draw triangle by connecting A,B,C points**
	 Angle	**Check the angles of the formed triangle**