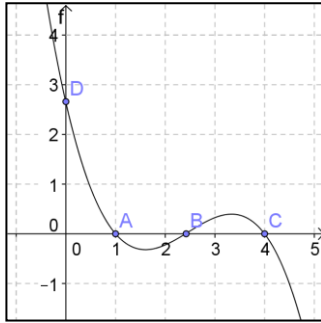


Problem Solving with GeoGebra

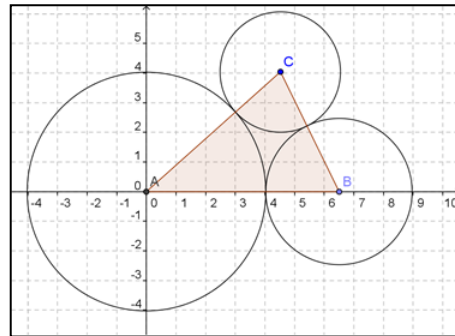
Construction Problems for AS Mathematics

1.



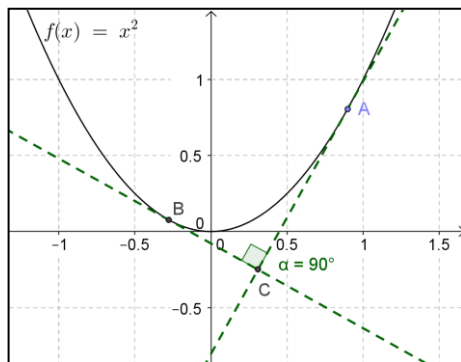
Create points A, B and C fixed to the x-axis and D fixed to the y-axis. Construct a cubic that passes through A, B, C and D.

2.



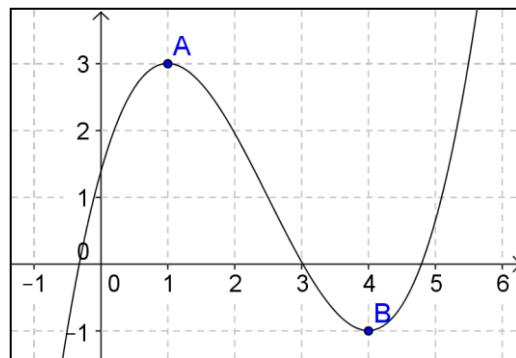
Create a triangle with one point on the origin and one point on the x-axis. Construct circles centred on each vertex such that all three circles touch each other.

3.



Plot the curve $f(x)=x^2$ and add a point A to the curve. Construct the point B such that the tangents at A and B are perpendicular.

4.

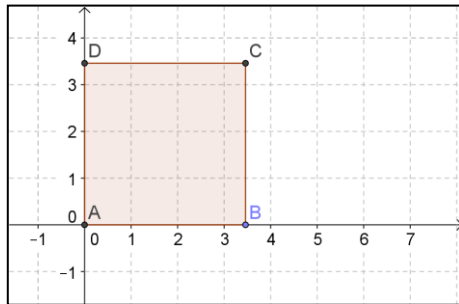


Create two points A and B. Construct a cubic that has stationary points at A and B.

Problem Solving with GeoGebra

Construction Problems for GCSE Mathematics

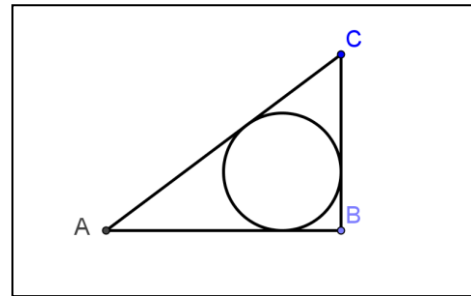
1.



Given a square with variable side construct a rectangle with the same area whose sides are in the ratio 2:1.

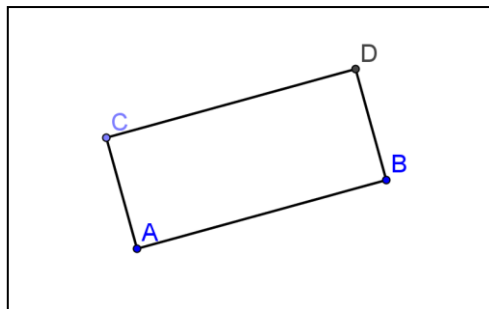
Can you extend this to $n:1$?

2.



Construct the largest circle (in-circle) in a 3-4-5 triangle? What is the radius of this circle? What about other triangles based on Pythagorean triples?

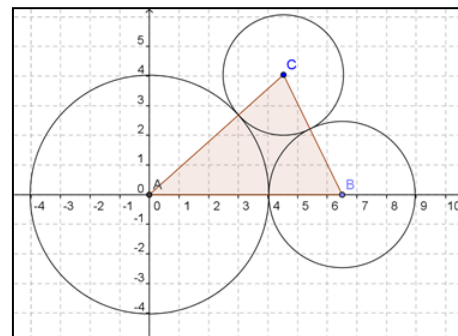
3.



Given two points A and B construct points C and D so that ABCD is a rectangle with both sides independently variable.

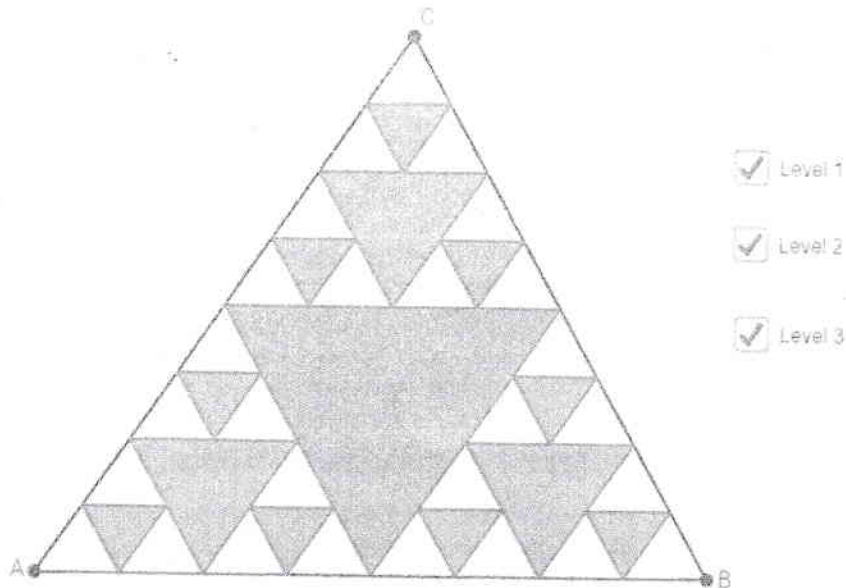
Construct a rectangle with twice the area whose sides are in the same ratio.

4.



Construct 3 circles on the vertices of a triangle such that the circles always just touch.




Sierpinski Triangle



Initial activities:

- Hide the Grid and Axes of the coordinate system
- Set Labelling – New Points Only

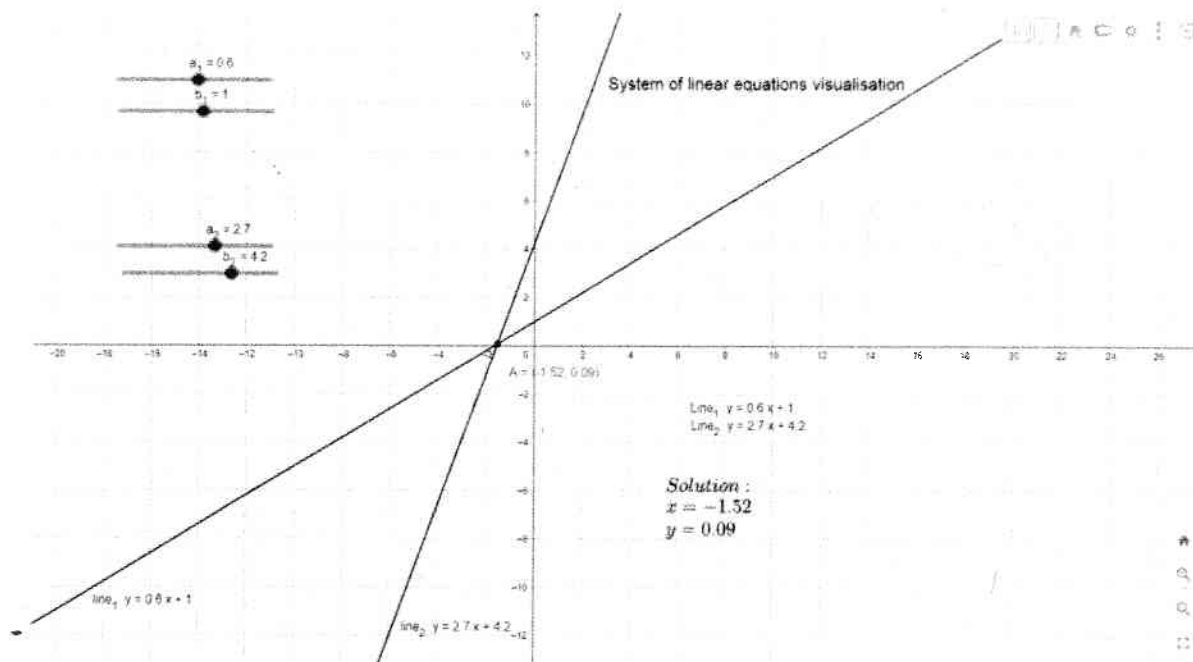
Instruction:

	<p>Construct a triangle ABC.</p> <p>Edit its features. In the Colour tab set the black one, set the Opacity to 0.</p>
	<p>Define the point D – the centre of triangle side AB</p> <p>Define the point E – the centre of triangle side BC</p> <p>Define the point F – the centre of triangle side AC</p>
	<p>Draw a triangle DEF.</p> <p>Edit its features. In the Colour tab set the blue one, set the Opacity to 50%.</p>
	<p>Create a new tool named Sierpinski.</p> <p>Main menu (top-right corner) -> Tools -> Create New Tool</p> <p>Output objects: points D, E, F, triangle DEF, sides of triangle DEF.</p> <p>Input objects: pints A, B, C.</p> <p>Name: Sierpinski</p> <p>Instructions: Click three noncollinear points.</p>
	<p>Use the tool to three blue triangles: ADF, DBE and FEC to create the second level of</p>







	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.




$DFC : \cancel{DF}, FC, DC$
 $FEB : \cancel{FE}, EB, FB$
 $EAD : EA, AD, \cancel{ED}$

System of linear equations visualisation



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

No	TOOL	PROCESS STEPS
1.		Insert text 1: <i>System of linear equations visualisation</i>
2.		Insert slider for a_1 (a_1), interval between -10 and 10, increment 0.1.
3.		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 line₁ : <i>line₁: y=a₁x+b₁</i>  <input type="text" value="line_1: y=a_1x+b_1"/>
5.		Insert slider for a_2 (a_2), interval between -10 and 10, increment 0.1.
6.		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 line₂

		$line_2: y=a_2x+b_2.$ Click the right mouse button on $line_1$ and choose Settings – card Basic – Show label: Name and Value (look point 4).
8.		Insert <u>dynamic</u> 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 <i>Advanced</i>
9.	 Intersect	Define the intersection of $line_1$ with $line_2$, using the tool <i>Intersect</i> 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 <i>empty formula box</i> from the scroll list <i>Advanced</i> . Type in everything in one line and in the end separate 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 <i>Settings</i> 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: \backslash , whereas for Space use: \backslash .
- Scroll the slider observing how the solution of coordinate system and its lines are changing