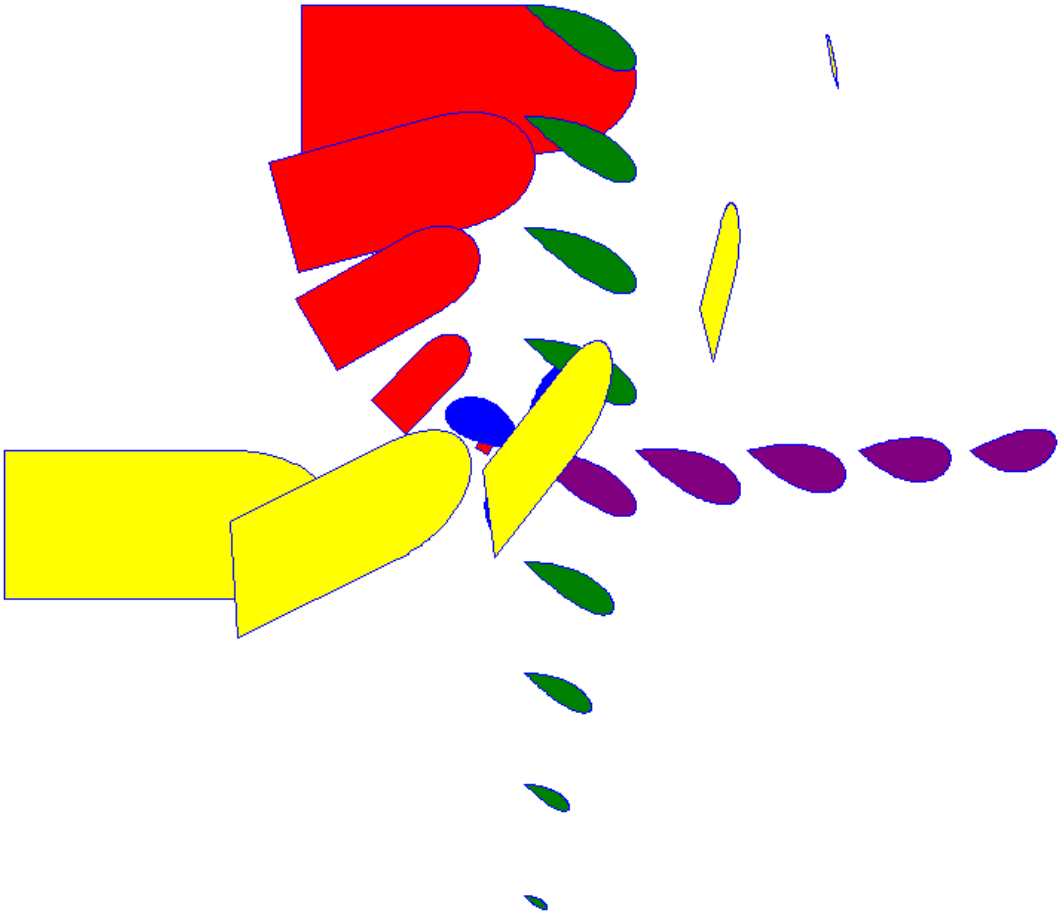
MA1008 Mini project

Art with geometry and engineering maths



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MA03

Capabilities

A brief overview of the capabilities is provided, See below for how to use these features and run the program.

Interactive input

Intuitive and simple click and drag interface for ease of use.

Text input

If the user wants to finely position the vertices, a text input is provided.

File input

Loading and saving to a file to work on later or to store a design.

Edit mode

Vertex coordinates
Snap to grid

Transformation table

Ease of viewing and editing the transformation values.

Preview mode

Allows fine tuning of transformations and allows user to view how the transformations will affect the polygon.

Final polygons

Show all polygons with all transformations.

Running the program

Required files

Python file:
MA1008_miniProject.py
Data files:
flower
Image files:
help.gif

Ensure all files are in the same directory. Open the python file in IDLE and run.

Controls

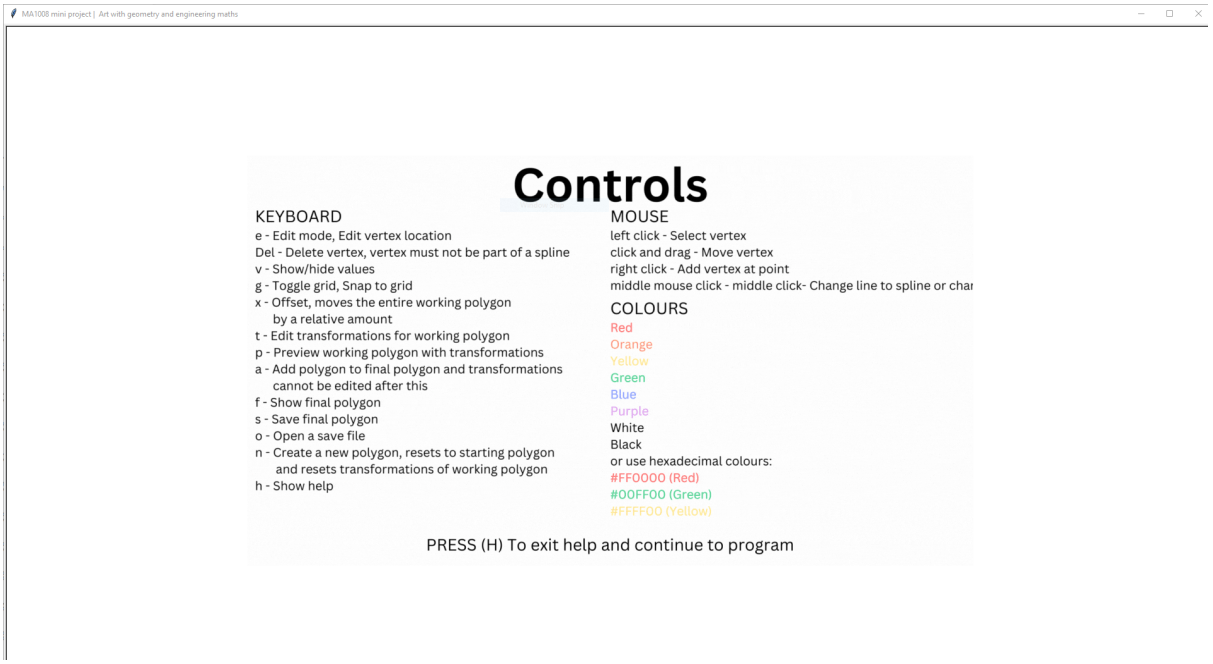
MOUSE

left click - Select vertex
click and drag - Move vertex
right click - Add vertex at point
middle mouse click - Change line to spline or change spline to line

KEYBOARD
e - Edit mode, Edit vertex location
Del - Delete vertex, vertex must not be part of a spline
v - Show/hide values
g - Toggle grid, Snap to grid
x - Offset, moves the entire working polygon by a relative amount
t - Edit transformations for working polygon
p - Preview working polygon with transformations
a - Add polygon to final polygon and transformations cannot be edited after this
f - Show final polygon
s - Save final polygon to file
o - Open a save file
n - Create a new polygon, resets to starting polygon and resets transformations of working polygon
h - Show help

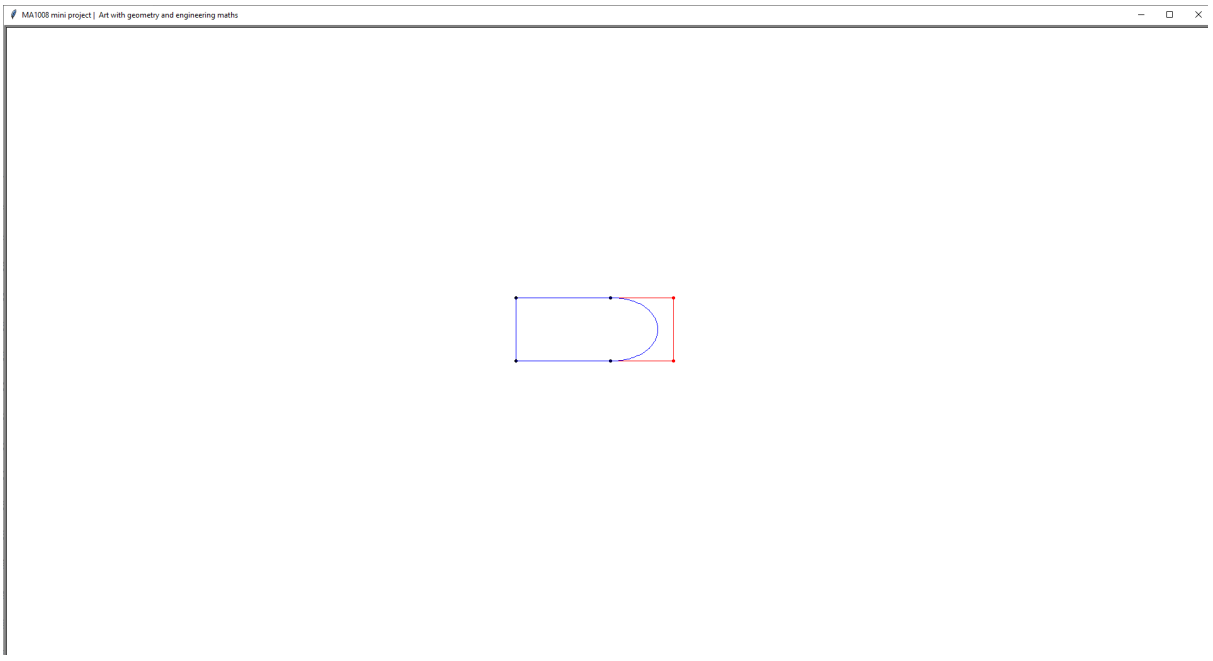
Program start

When the program starts, a help will be shown. Press ‘H’ to close and continue to edit mode.

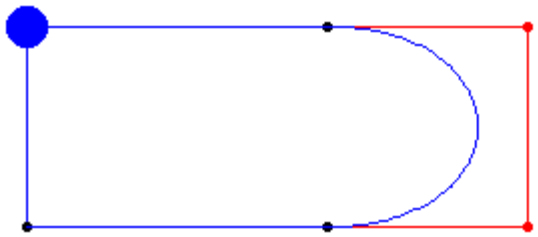


Edit mode

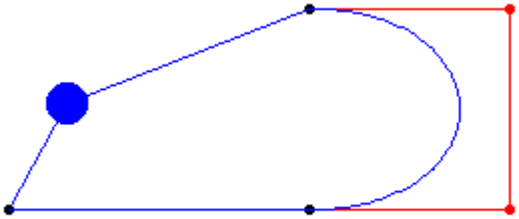
You will be presented with a basic starting polygon.



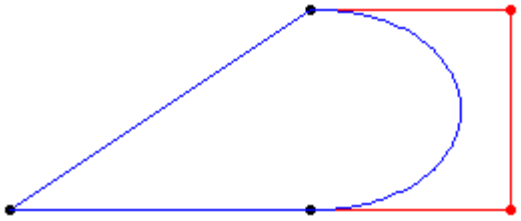
Left click to select a point.



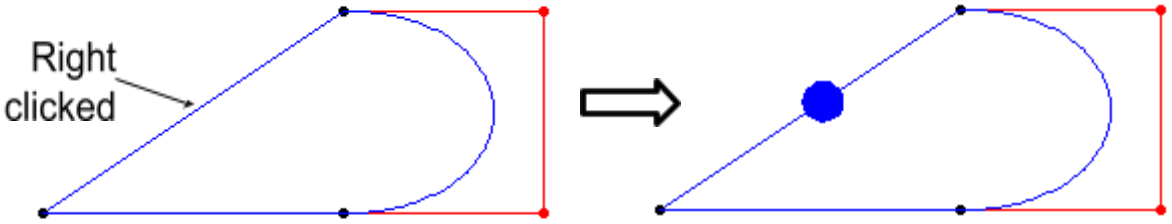
Drag the selected point to move it.



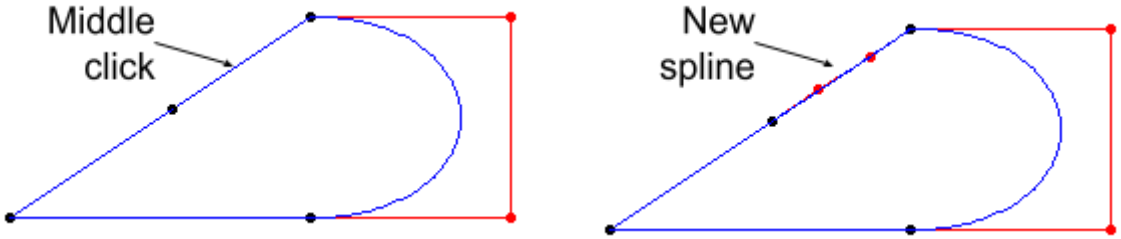
Press the ‘Delete’ key to remove it.



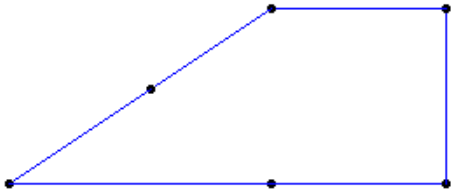
Right click a point on a line to add a vertex at that point.



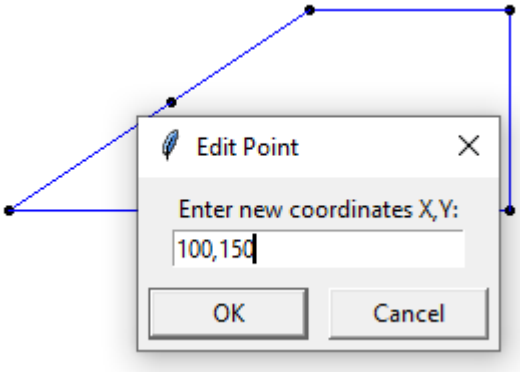
Middle mouse click is used to turn a line into a spline



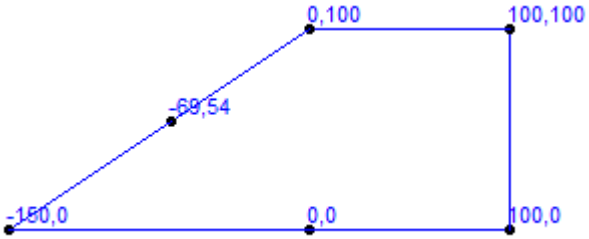
Use Middle mouse click to turn a spline into a line.



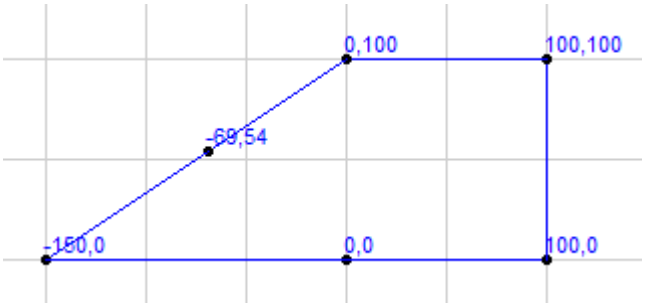
Press ‘E’ after selecting a line to edit the coordinate of the point.



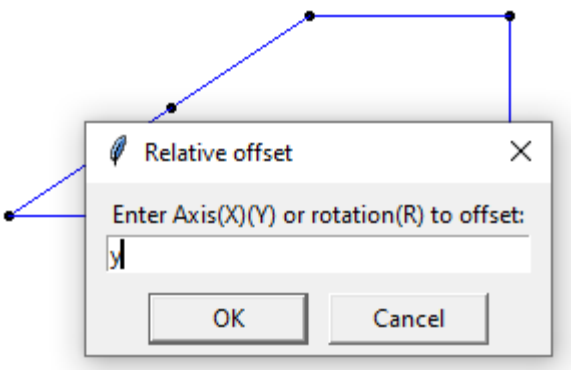
Press ‘V’ to toggle on and off coordinates at the vertices.

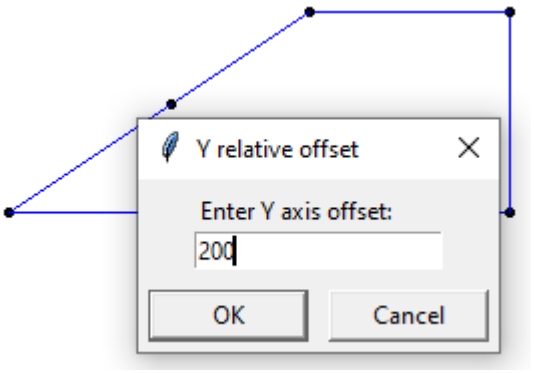


Press ‘G’ to toggle on and off snap to grid. When on, the dragged point will snap to the nearest grid point. Grid points are in increments of 50px.



‘X’ will allow the user to offset the entire polygon. There will be a choice of X, Y anis or rotation.





Transformation mode

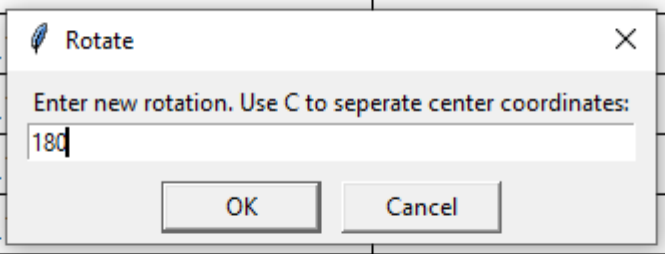
Here, the user is able to edit the transformations of the polygon.

Pattern count	5	
Transform pattern X	0	px
Transform pattern Y	0	px
Rotate pattern	60	deg
Scale pattern X	100	%
Scale pattern Y	100	%
Shear pattern X	0	%
Shear pattern Y	0	%
Reflection	None	
Line colour	Blue	
Fill colour	red	

Left click on the row to edit to edit the value of the specific transformation.

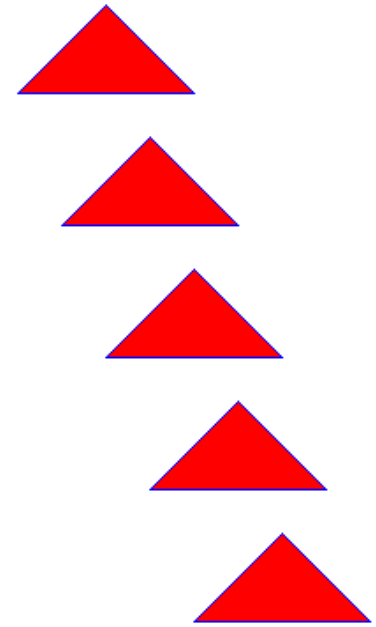
Below, rotate pattern is clicked. Enter the new value of the transformation

Pattern count	5	
Transform pattern X	0	px
Transform pattern Y	0	px
Rotate pattern	60	deg
Scale pa		%
Scale pa		%
Shear pa		%
Shear pa		%
Reflection	None	
Line colour	Blue	
Fill colour	red	

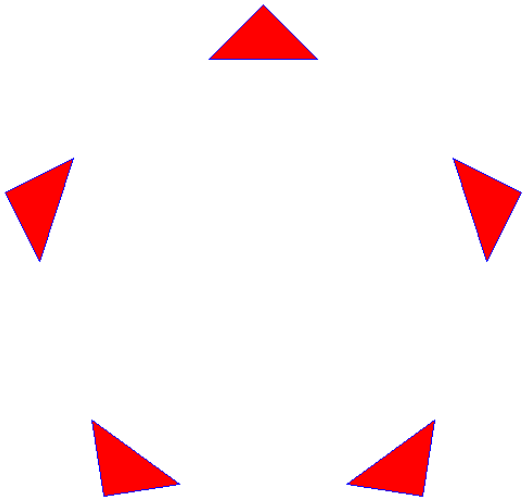


Available patterns

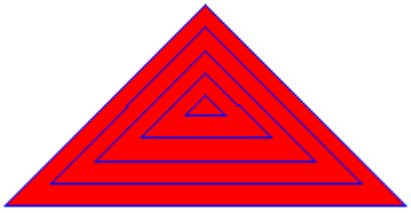
Linear pattern with x, y translation



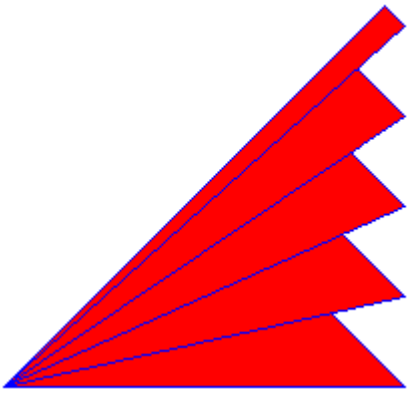
Rotation pattern



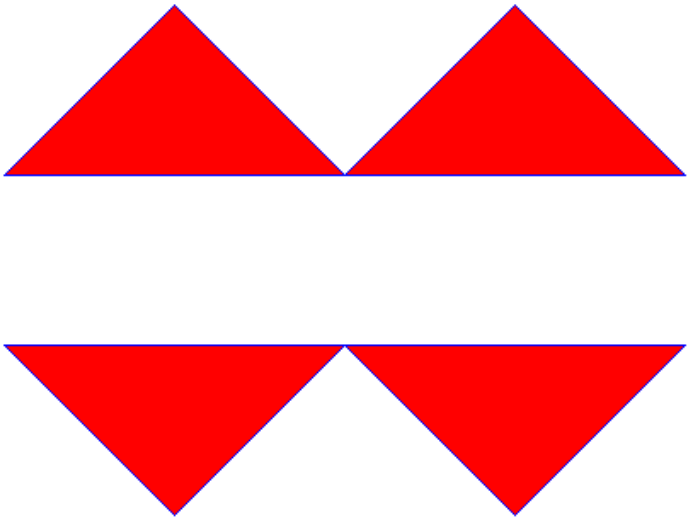
Scale pattern



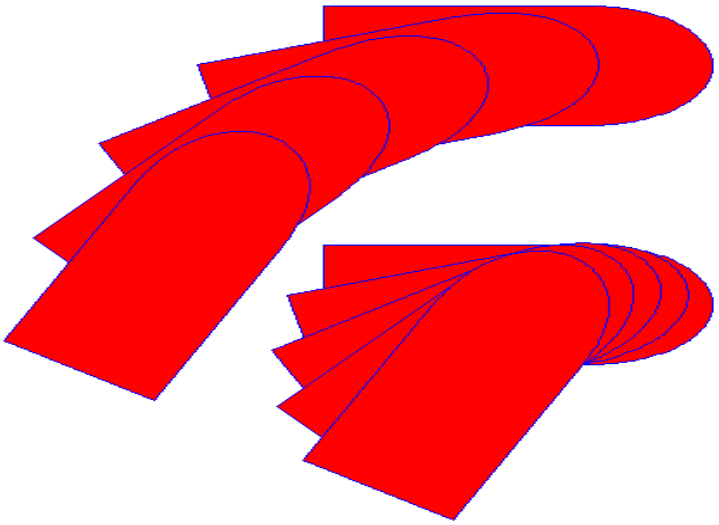
Shear pattern



Reflection. Both X and Y are reflected below.

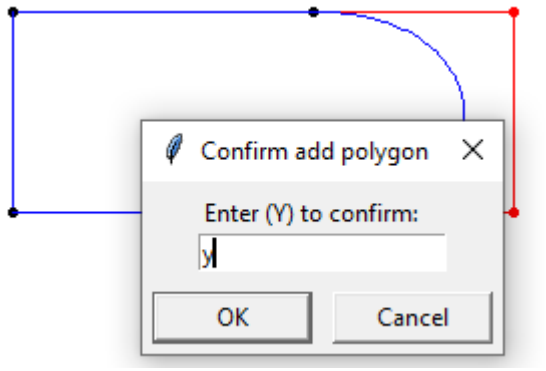


A combination of any and all transformations are available.

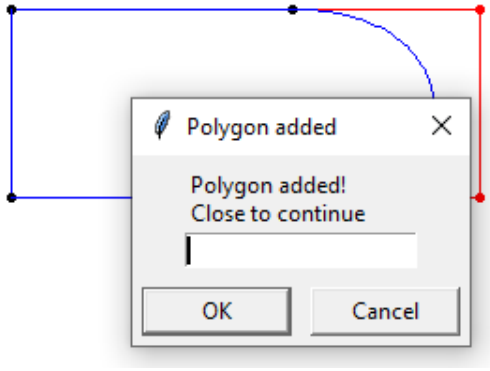


Preview mode

Preview mode allows previewing of the pattern before adding it to the final pattern.
Press ‘A’ to add the current working polygon to the final pattern.

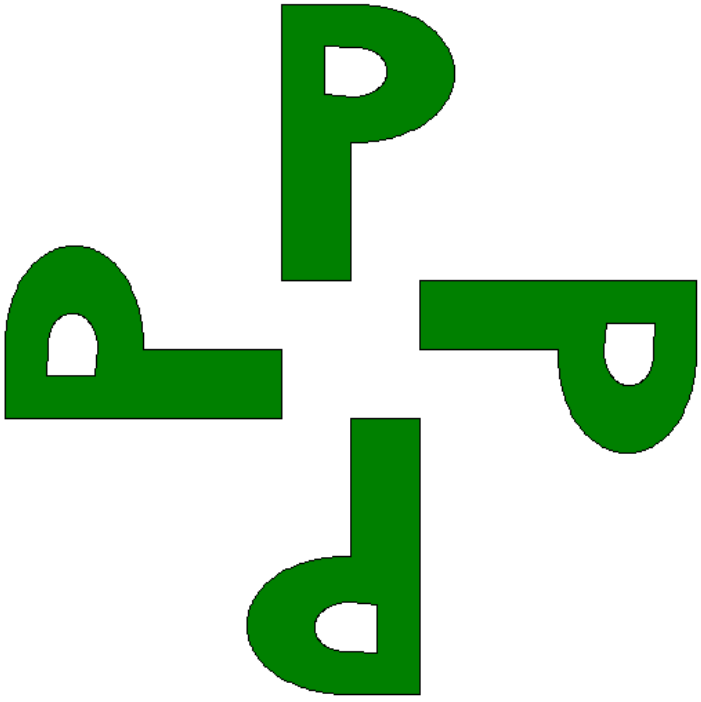


There will be a confirmation prompt. Close it to continue.



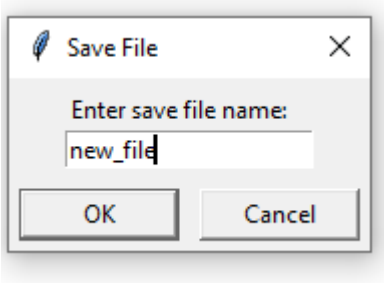
Final pattern mode

View the final pattern. The final pattern includes all polygons and patterns



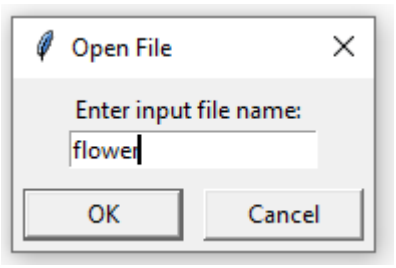
Save file

Asks the user which file to save to(overwrite), or a new filename.



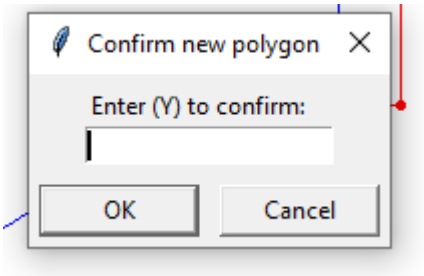
Load file

Prompts user for a file to load.



New file

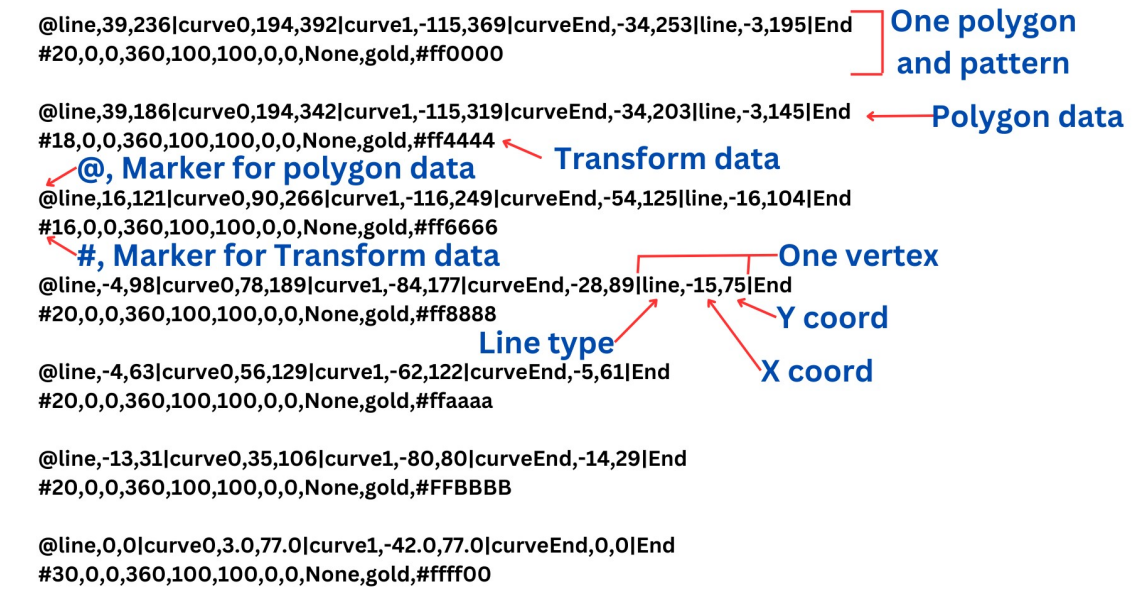
Reset working polygon to default. Removes working polygon. Confirms with user first.

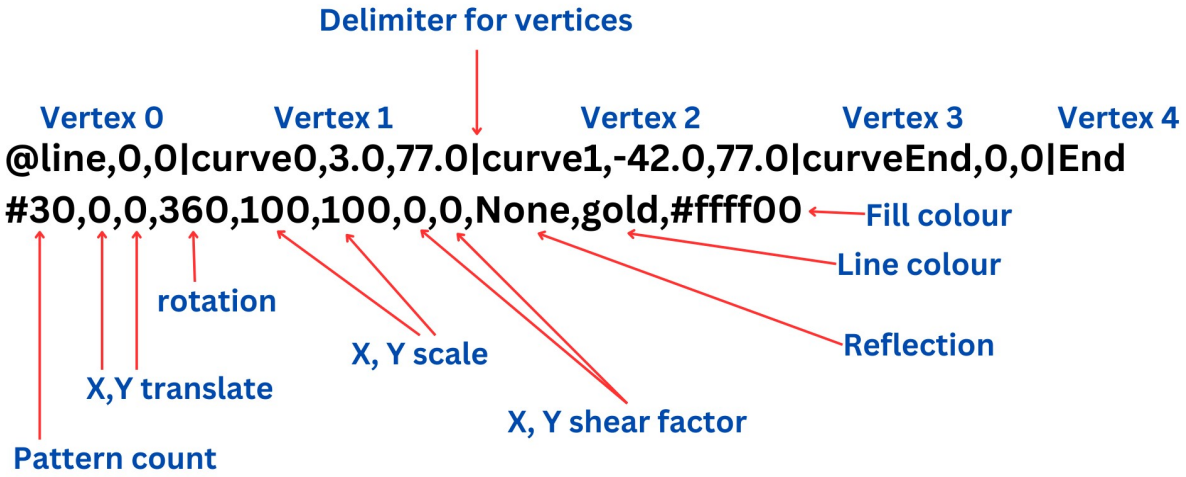


Show help

Press ‘H’ to show help again if needed

Data file format

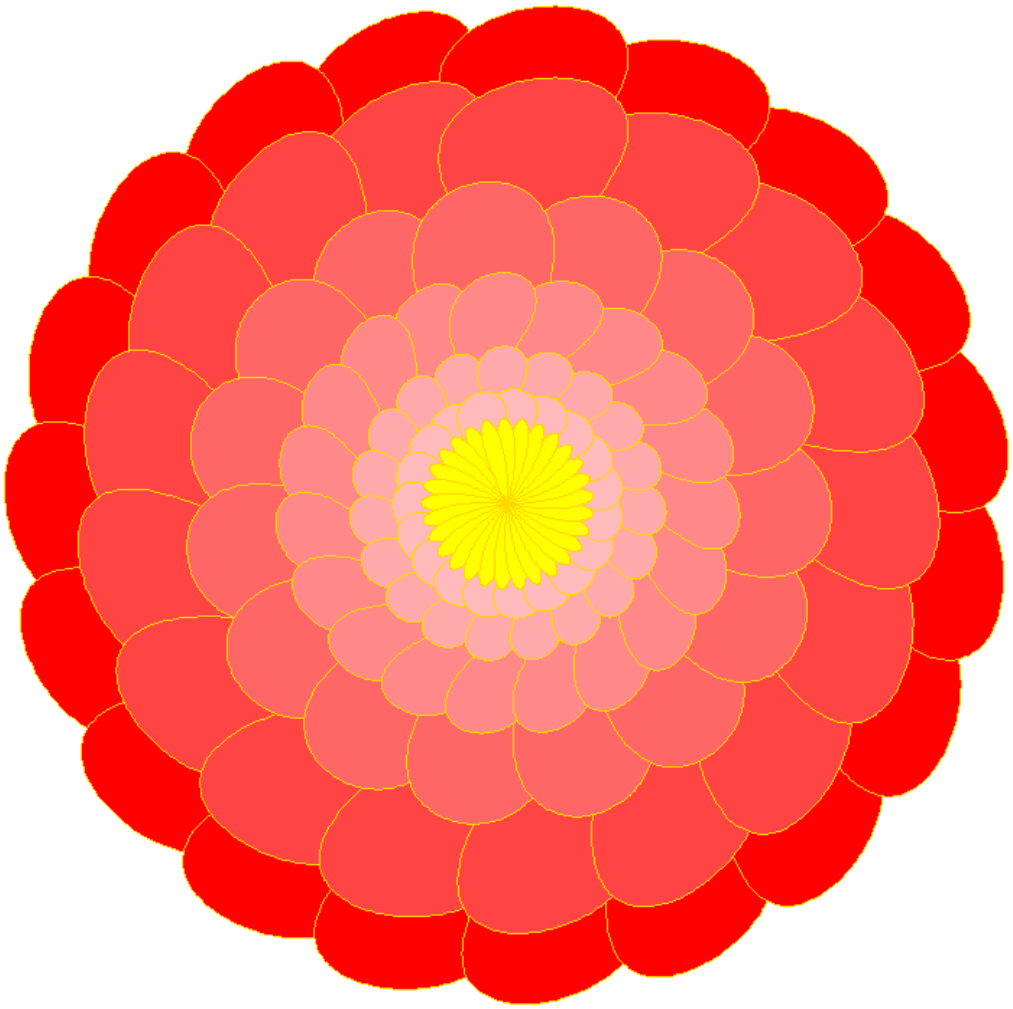




Sample program output

flower

flower features layers of circular patterns

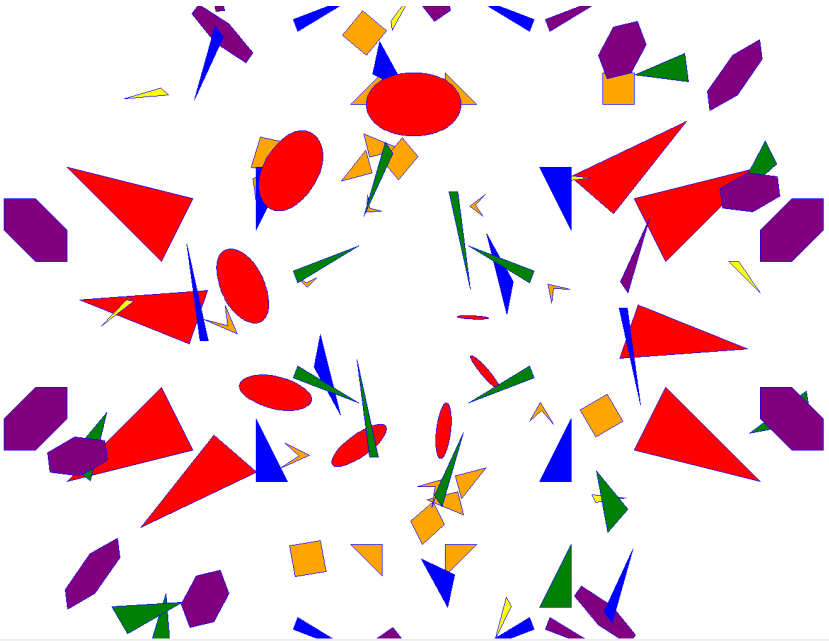


letter

Consists of the letters A, B C and D. A is linear patterened with scale. B is linear patterened with scale and rotation on the left and with scale and shear on the right. C is patterened with linear and rotary pattern and reflection. D uses transformation, rotation, scale and shear.

scope

Scope tries to recreate what a kaleidoscope looks like. It uses all the transformations.



Strengths and limitations

The interactive input allows the user to more easily pick up the program. The finer control is provided with a text input and a snap to grid feature is included for faster design. However, The program does not provide a way to edit the final pattern. This program does not dynamically adapt to the screen resolution and works best on 1080p displays and the provided data files are intended for 1080p displays.

Bonus features

Bonus features not included in the requirements are.

- Snap to grid
- Vertex coordinates
- Change colour of line and fill

Declaration

The python program, data files and assets are 100% written or created by me.

References

- https://docs.python.org/3/library/turtle.html
- https://docs.python.org/3/library/math.html
- https://wikimedia.org/api/rest_v1/media/math/render/svg/aad3f60fa75c4e1dcbe3c1d3a3792803b6e78bf6
- https://docs.python.org/3