An IPE Tutorial

Soeren Nickel

Seminar in Algorithms Graphs and Geometry · WS2021

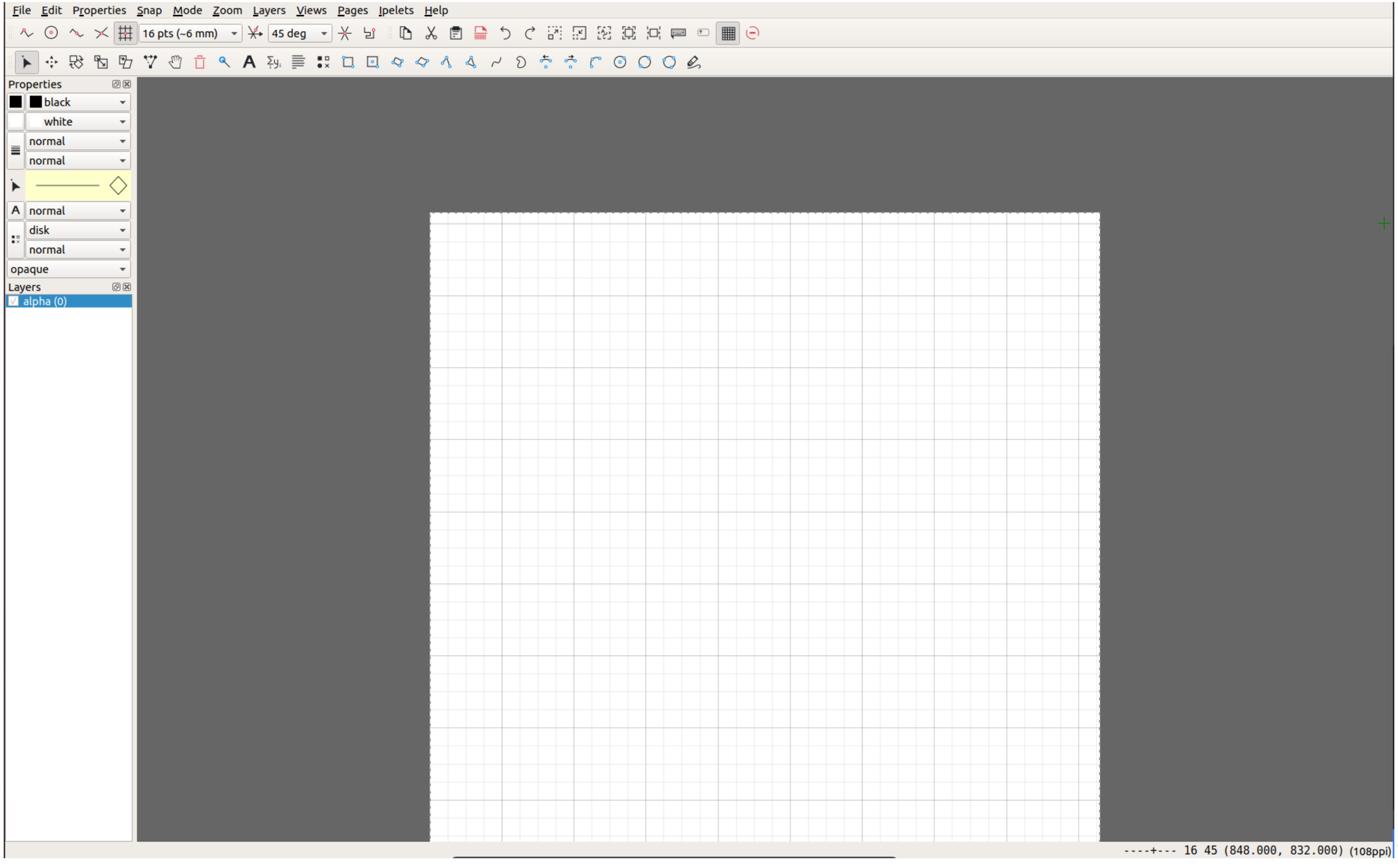
Algorithmic Geometry · WS2021

...and the rest

TU WIEN Informatics

ALGORITHMS AND COMPLEXITY GROUP

IPE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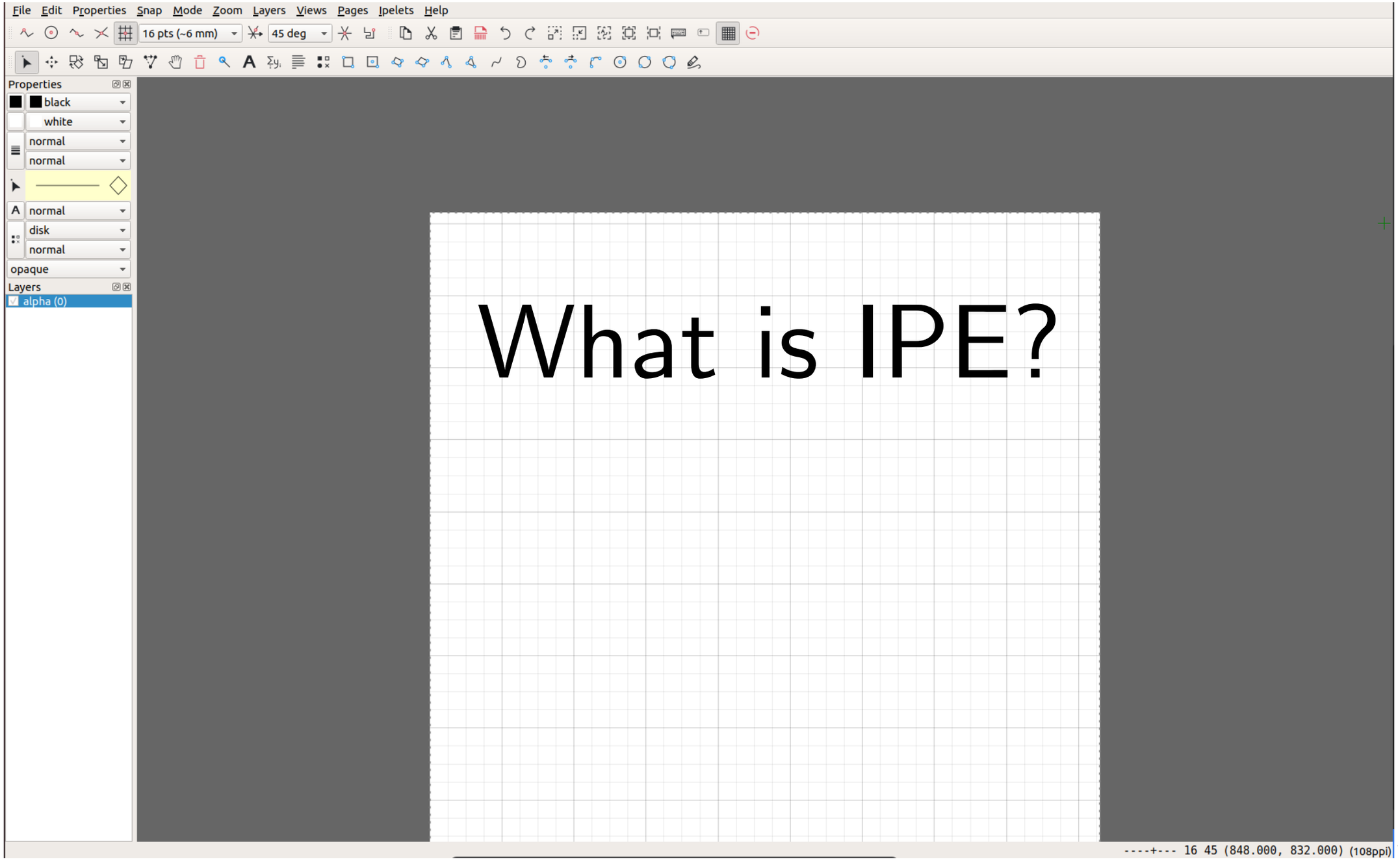
----+--- 16 45 (848.000, 832.000) (108ppi)

IPE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What is IPE?
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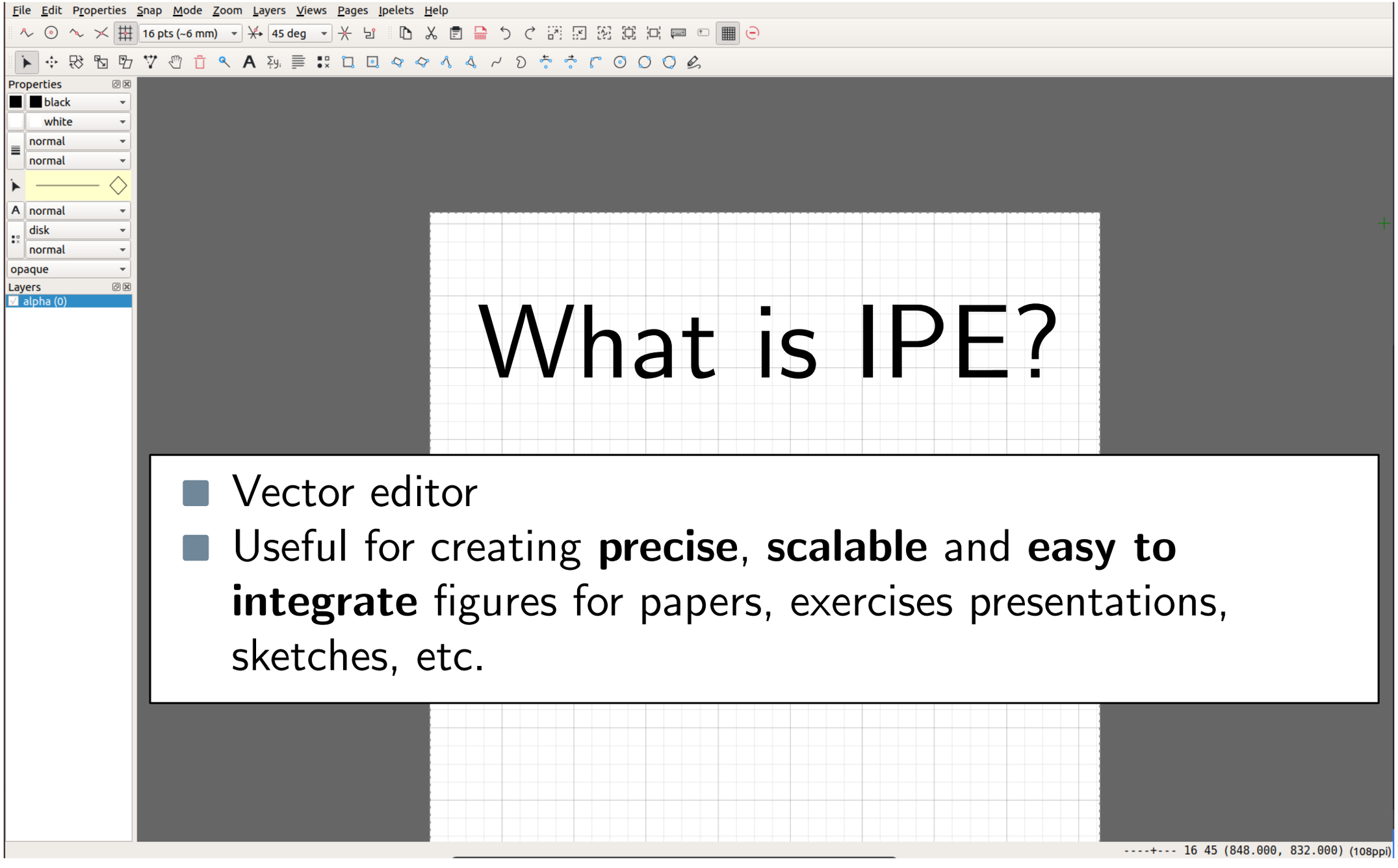
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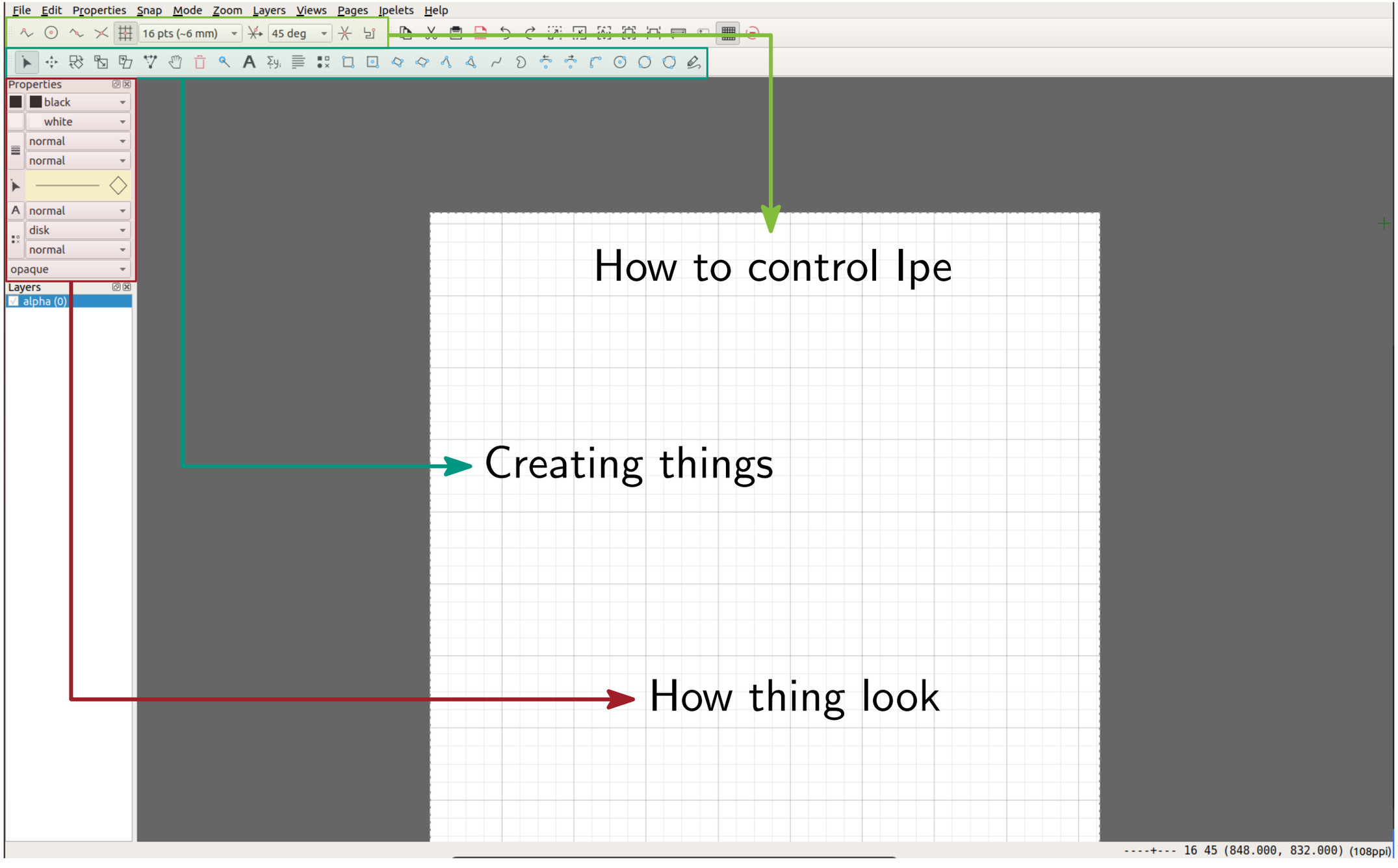
What is IPE?
Vector editor
Useful for creating precise, scalable and easy to integrate figures for papers, exercises presentations, sketches, etc.
----+--- 16 45 (848.000, 832.000) (108ppi)

IPE Interface Overview



The Tools

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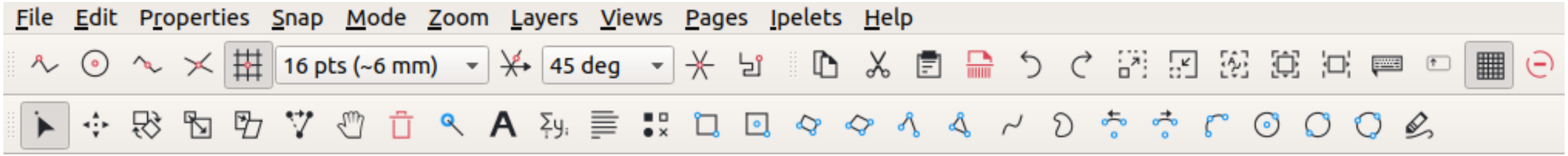

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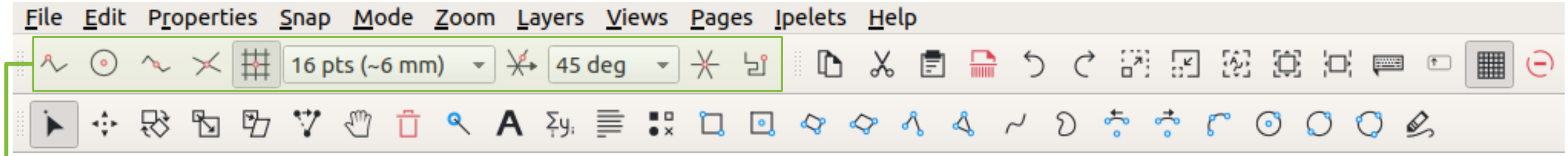

Grid & Snapping

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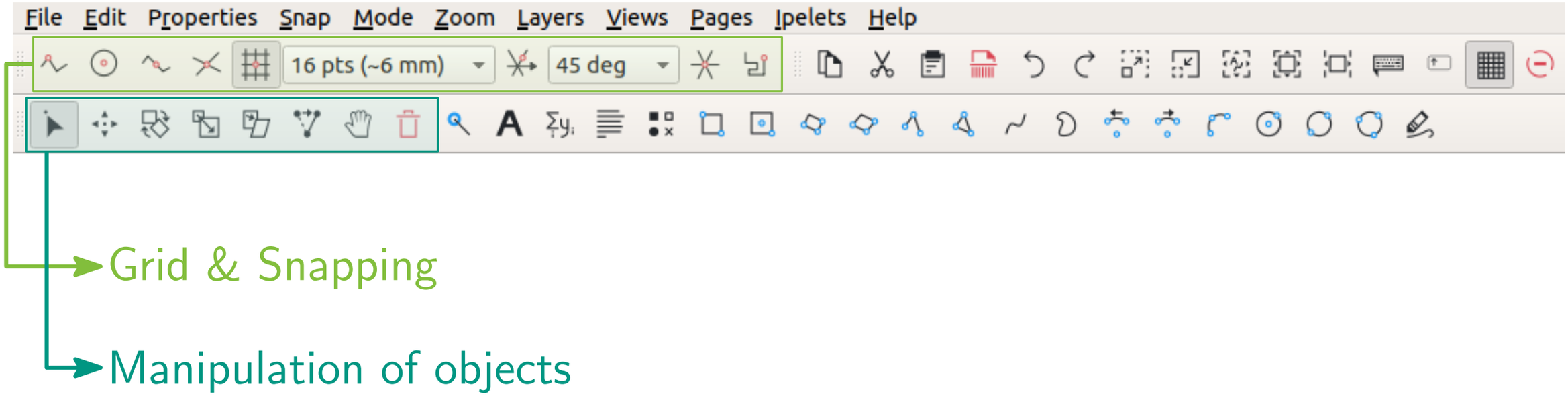

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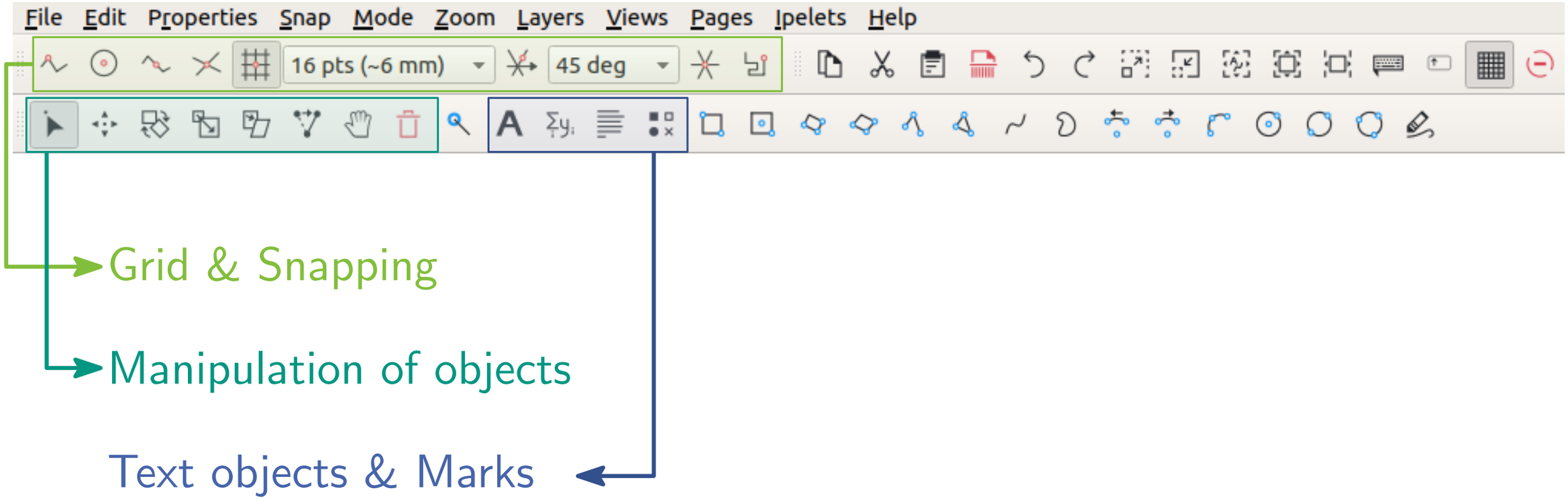

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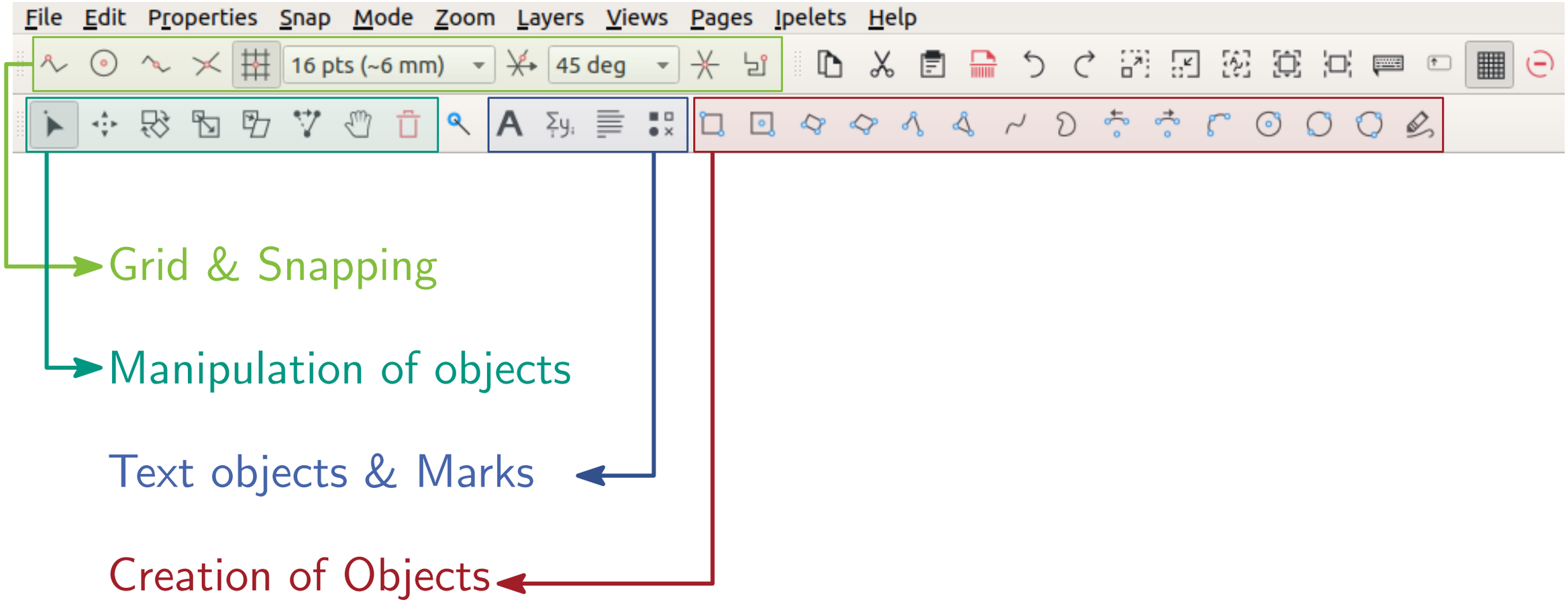

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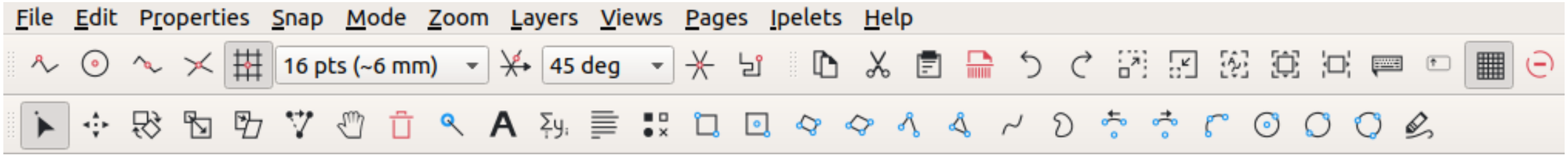

An Example:

- A line between blue points

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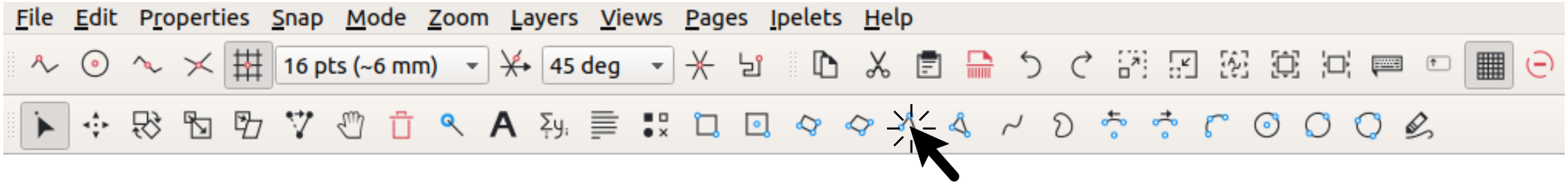

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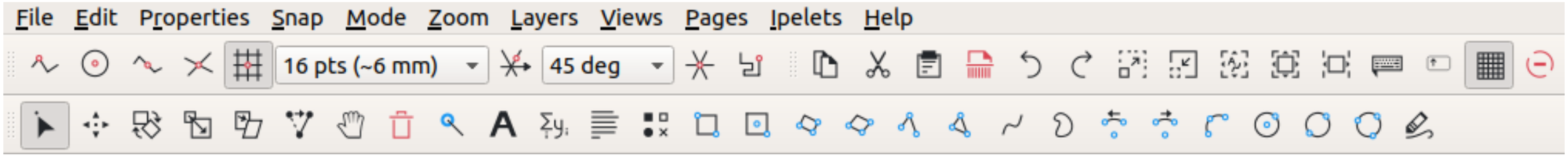

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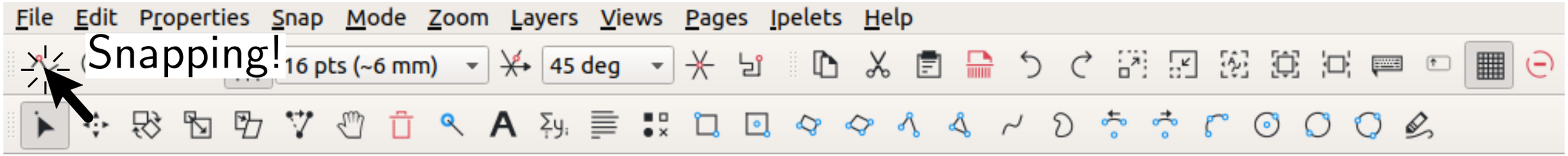

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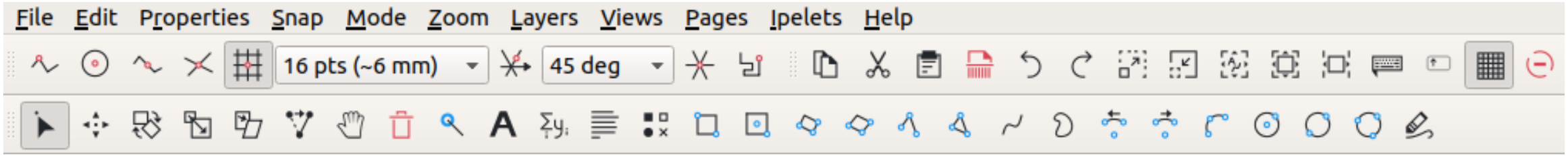

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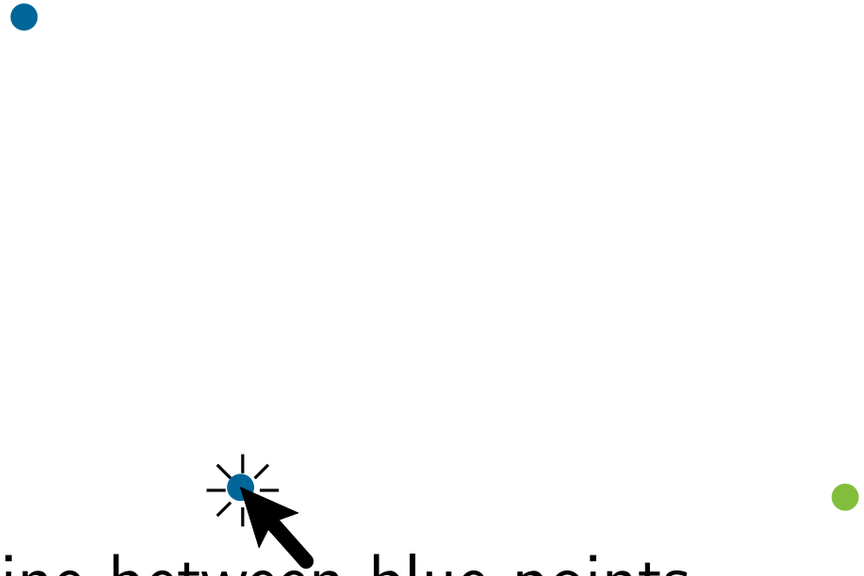

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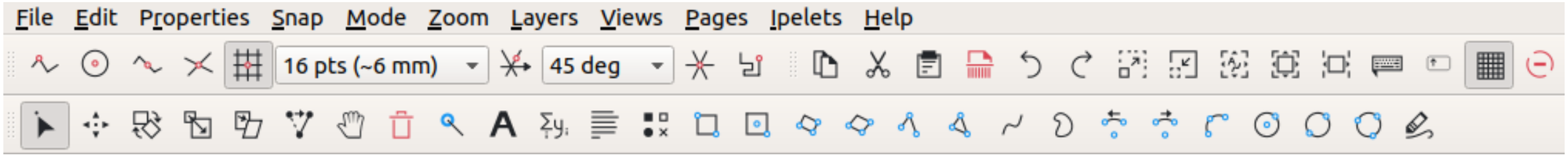

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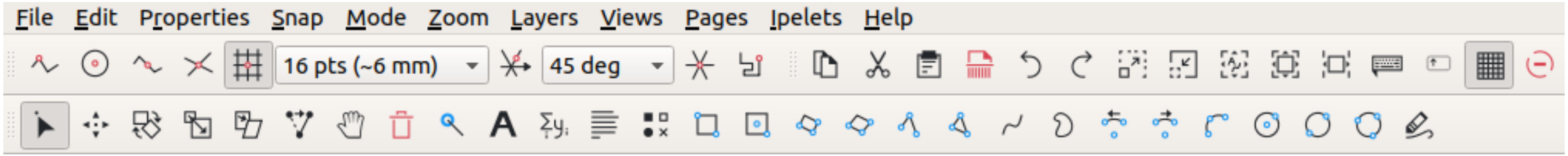

An Example:

- A line between blue points
- A circle segment around green, staring on red ending on the line

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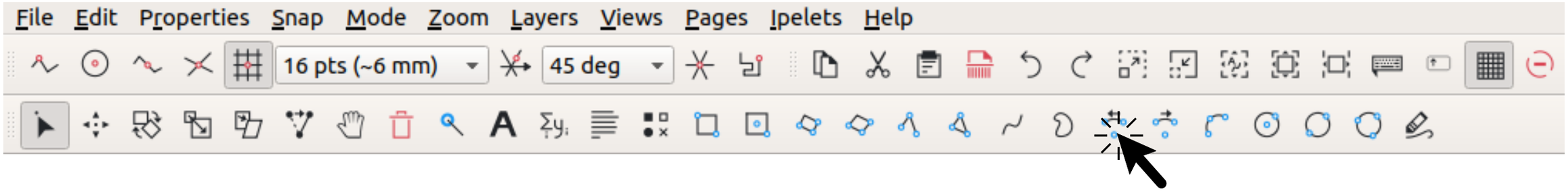

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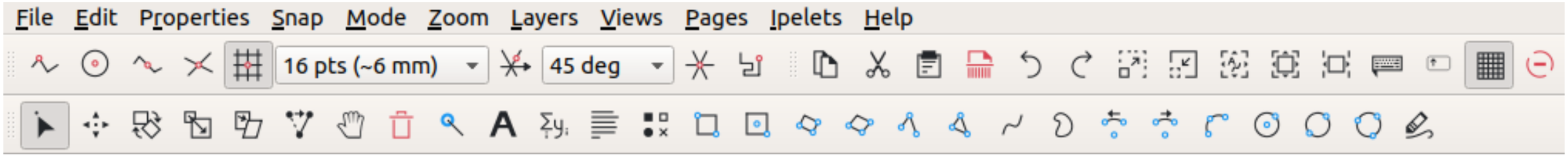

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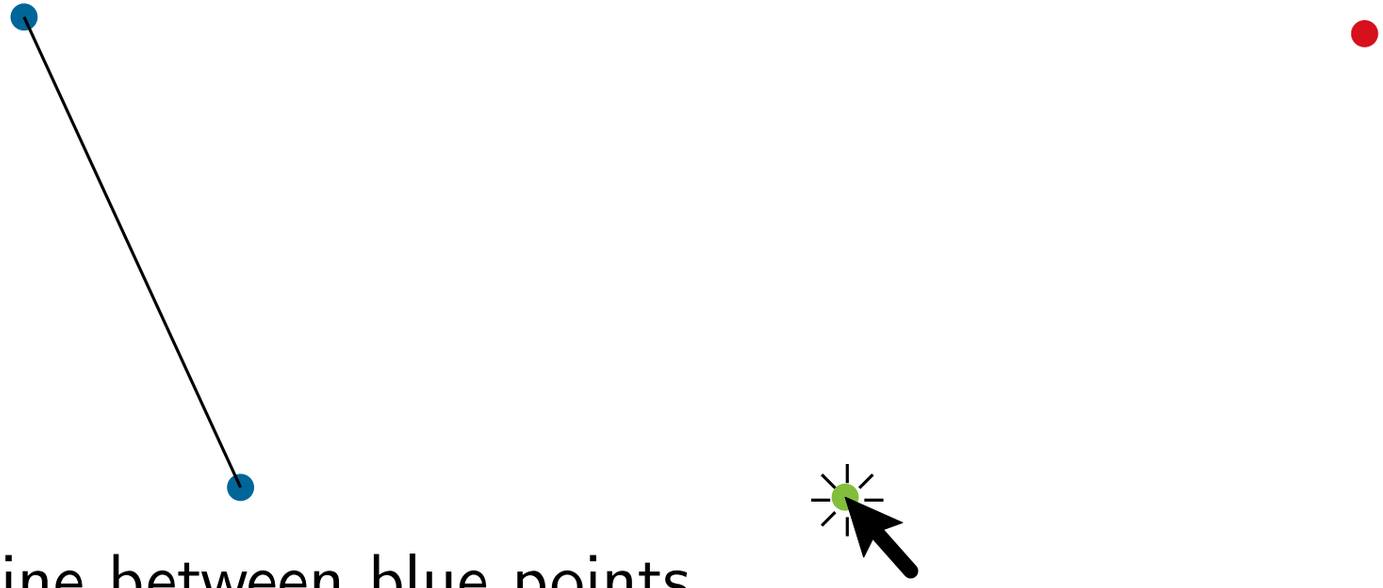

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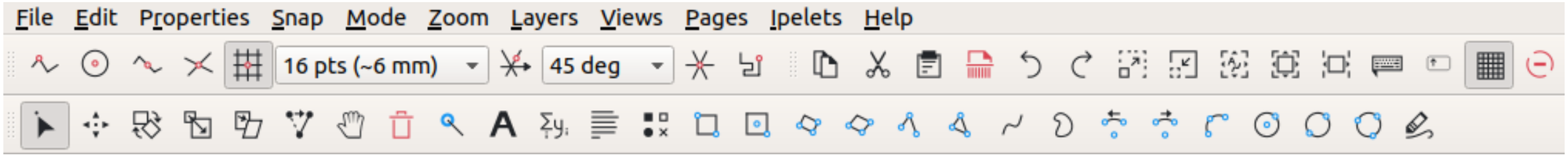

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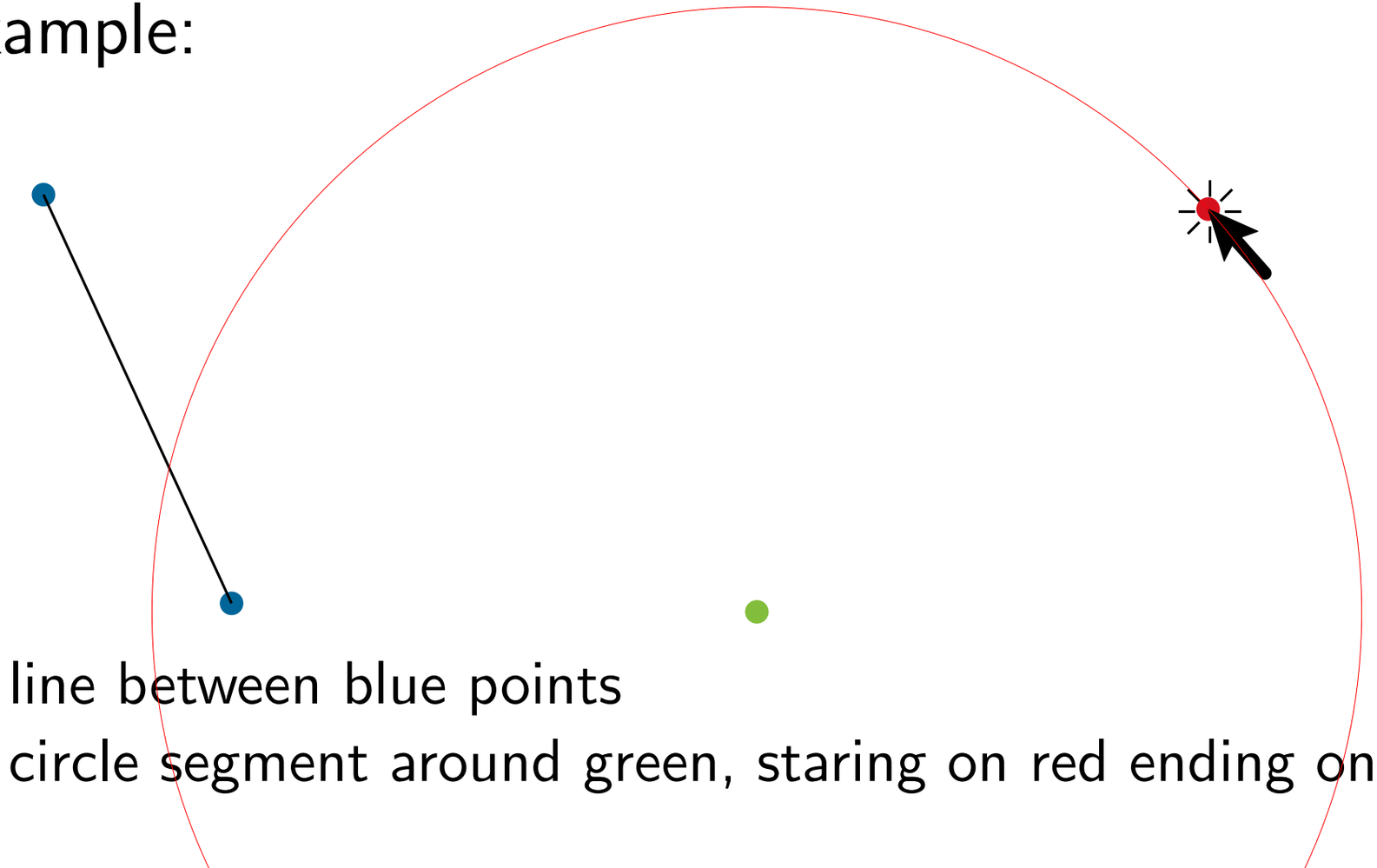

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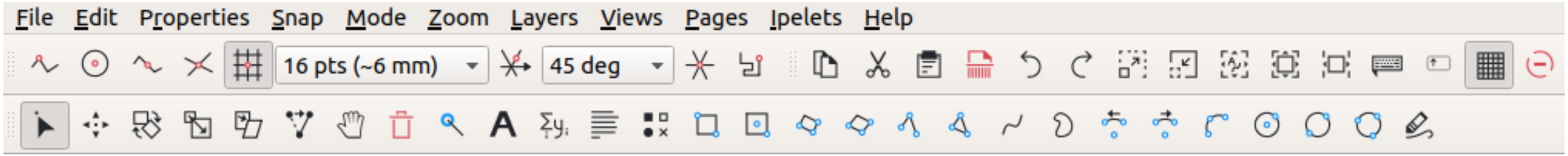

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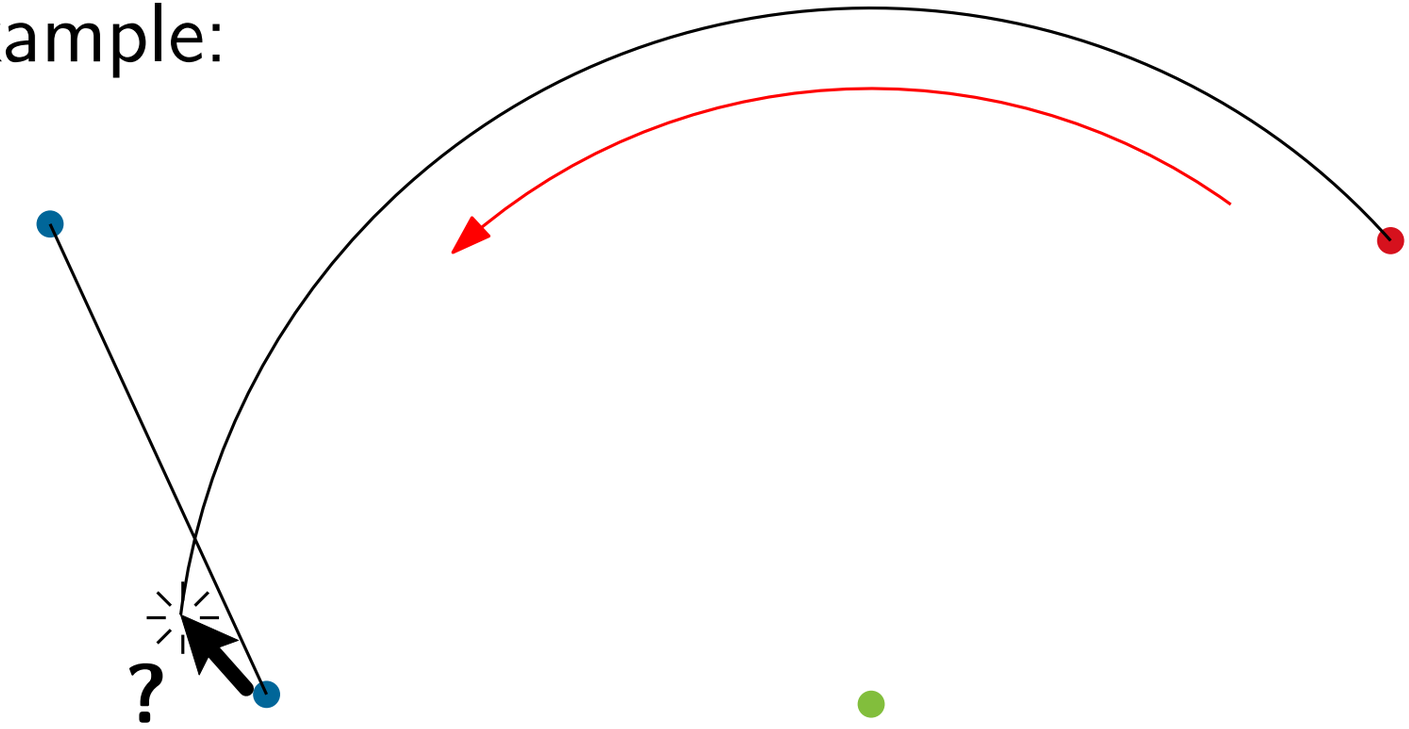

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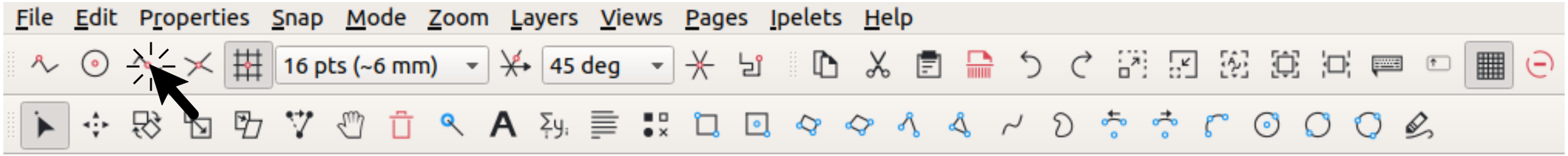

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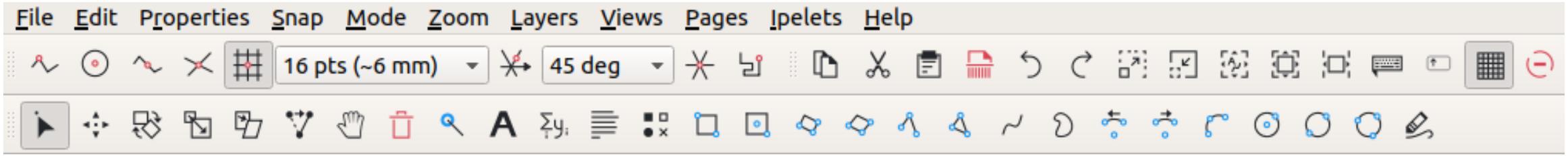

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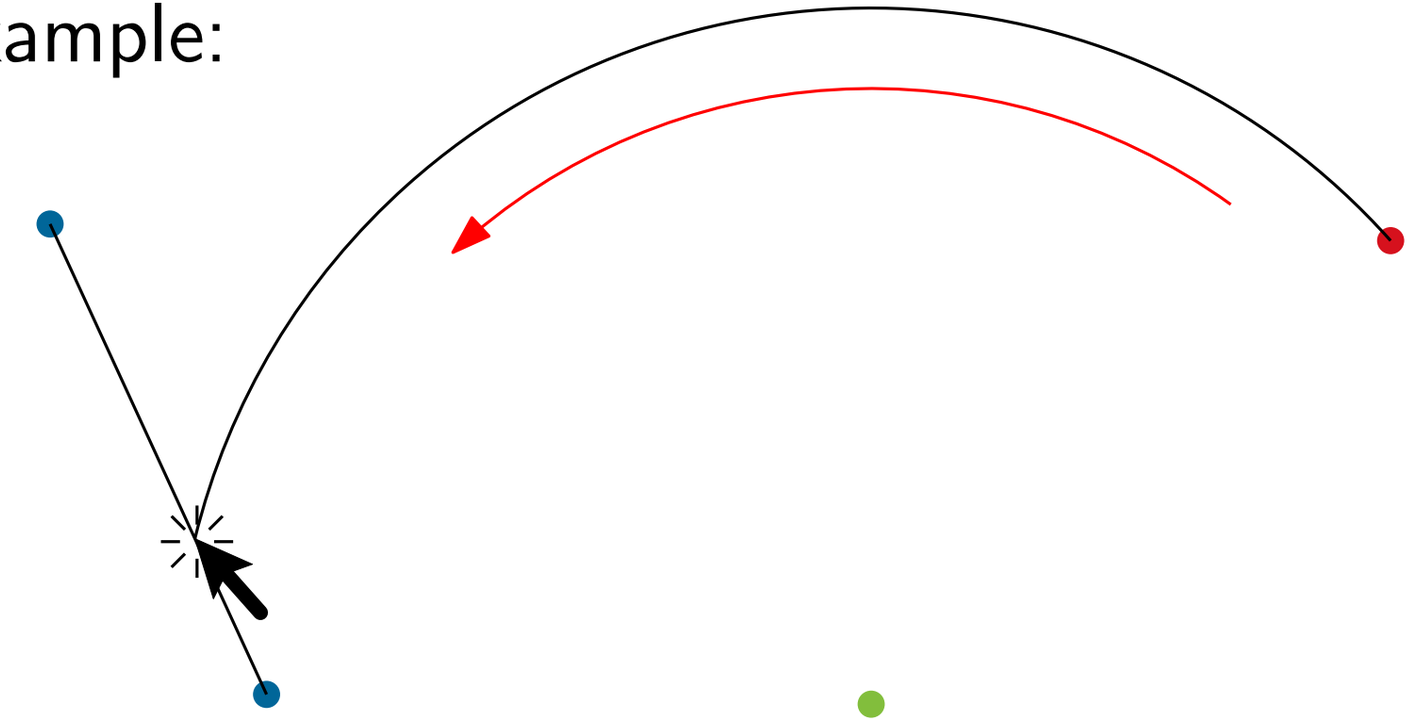

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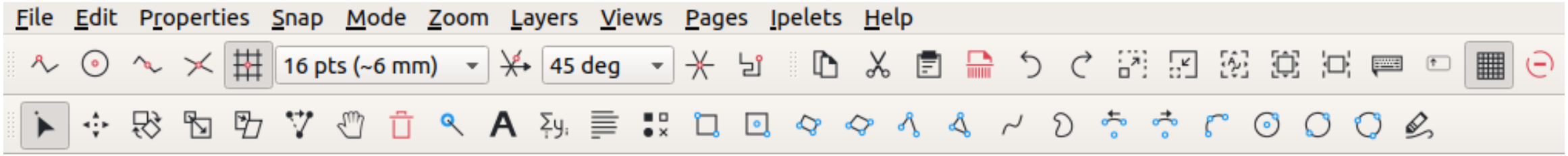

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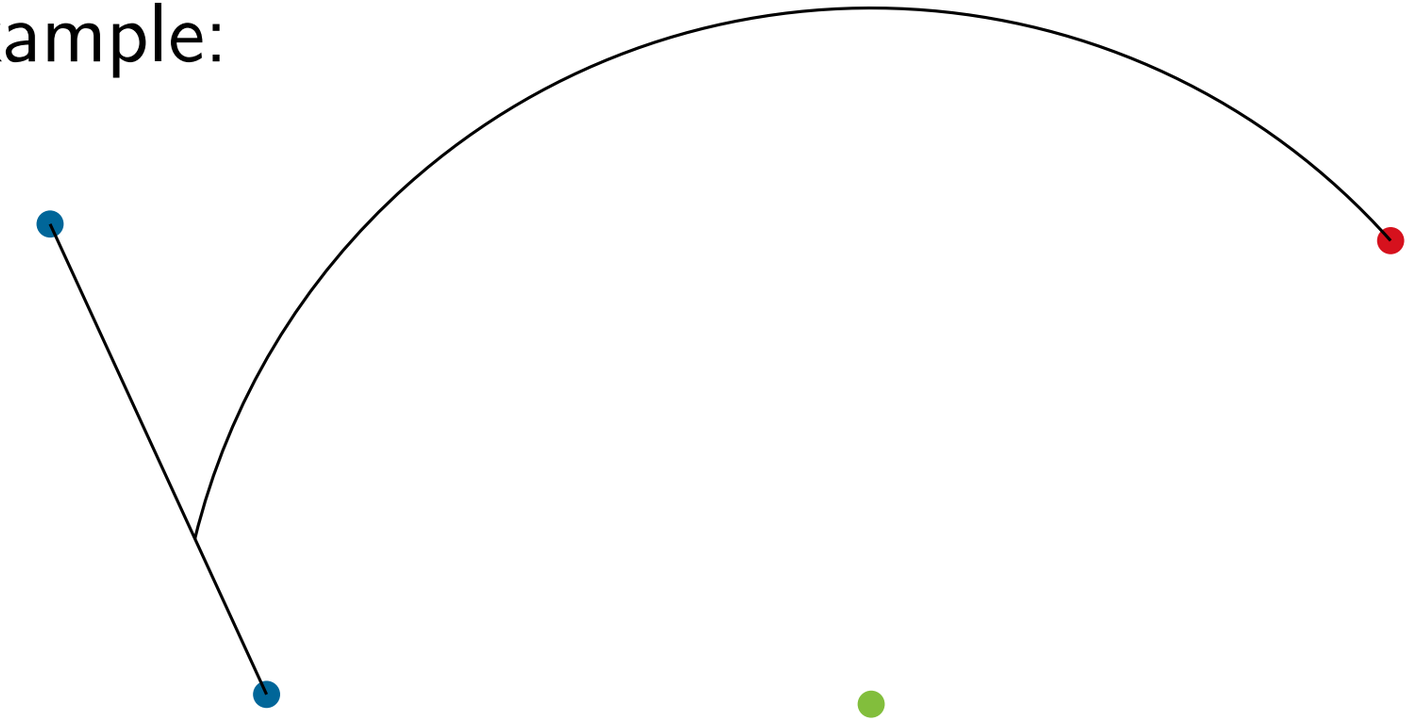

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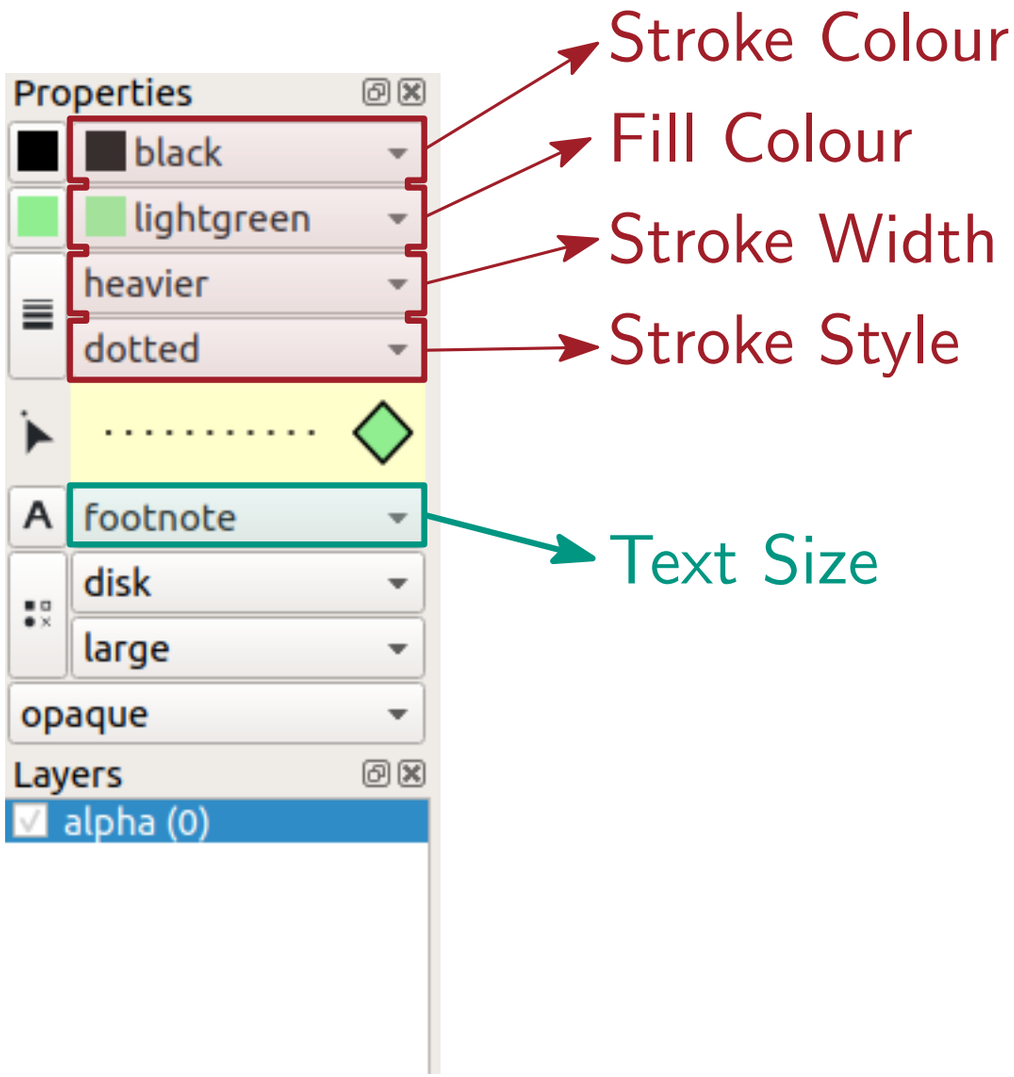

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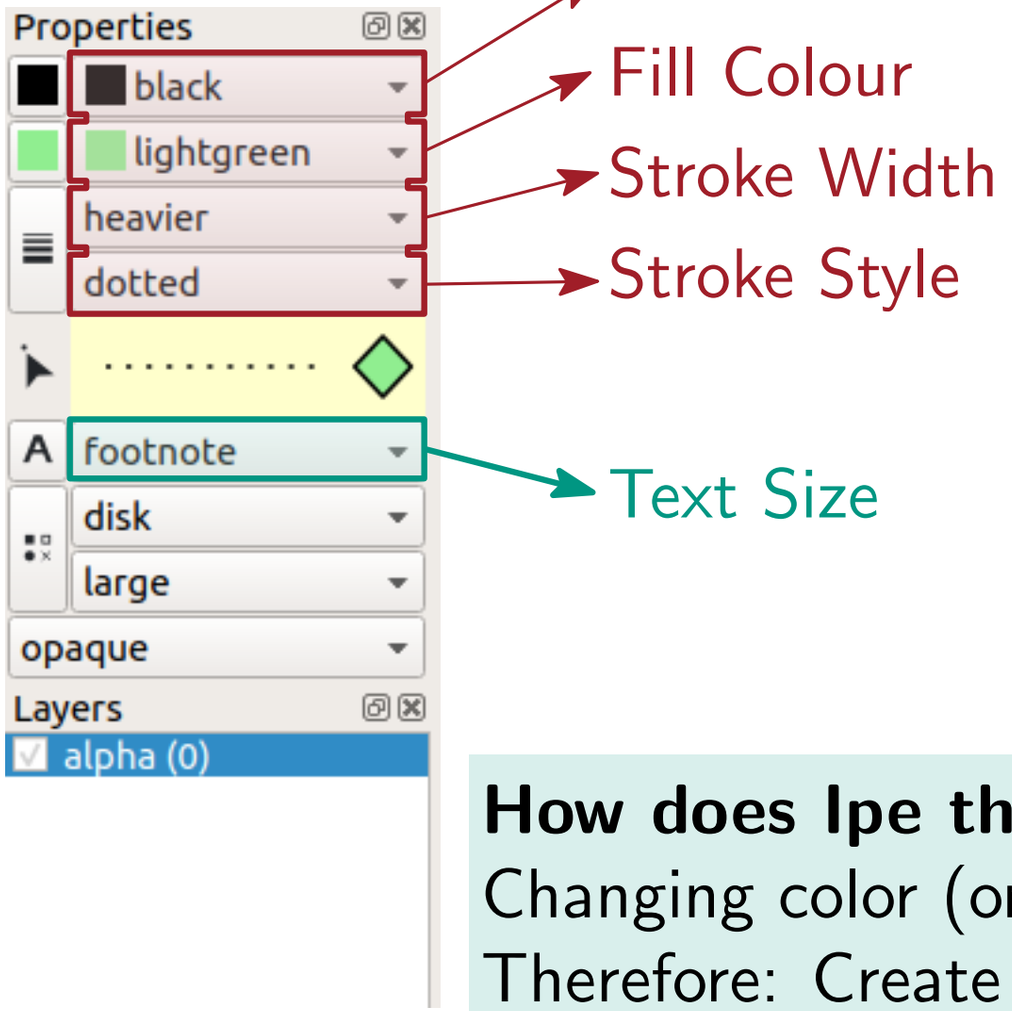
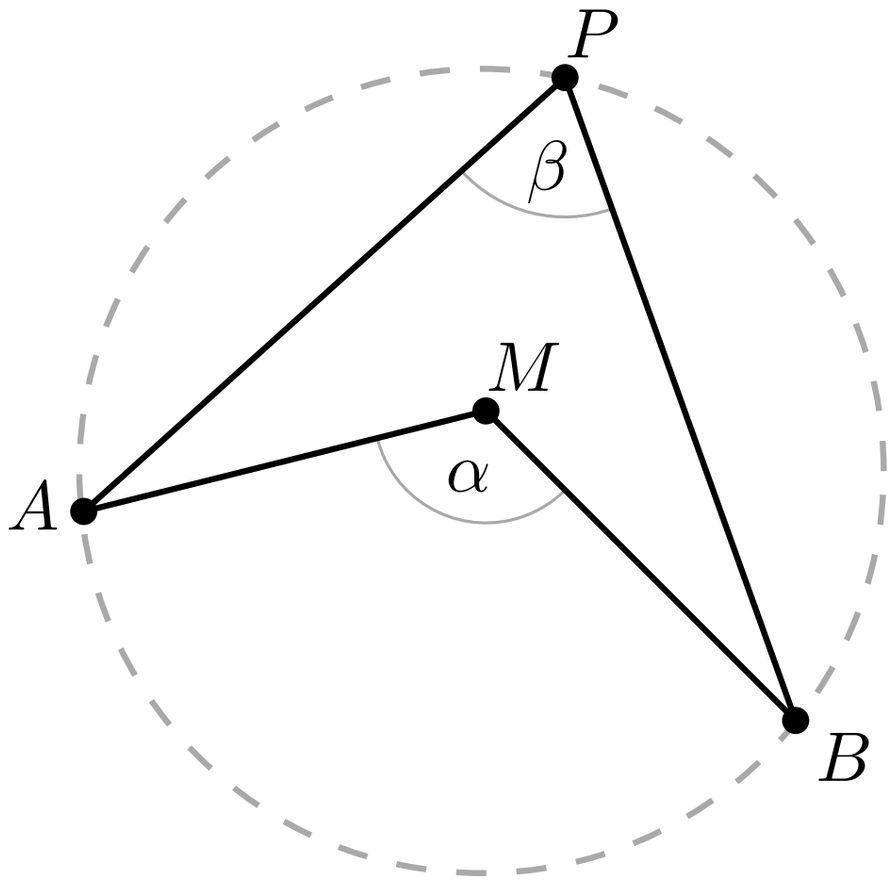


How does Ipe think?

Changing color (or something) changes the **selected** object!

Therefore: Create and then style!

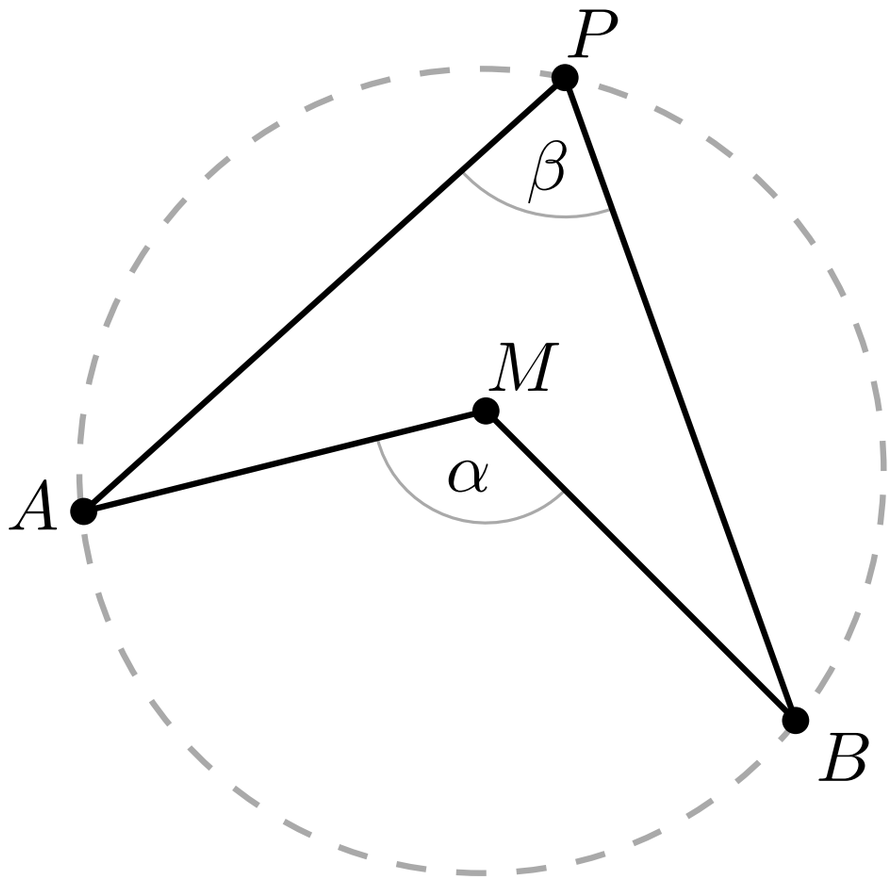
Demo I



The angle at the midpoint M is double the size of the angle at P ($\alpha = 2\beta$)

$\sim$ 5 minutes

Demo I



The angle at the midpoint M is double the size of the angle at P ($\alpha = 2\beta$)

Some useful shortcuts:

- [S] Select
- [E] Scale
- [R] Rotate
- [T] Translate
- [M] Marks
- [G] Minipage Text

$\sim$ 5 minutes

Text, LaTeX and the .ipe File

- An .ipe file is XML format

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</page>
<page title="Demo I">
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- Text objects and labels are interpreted as LaTeX

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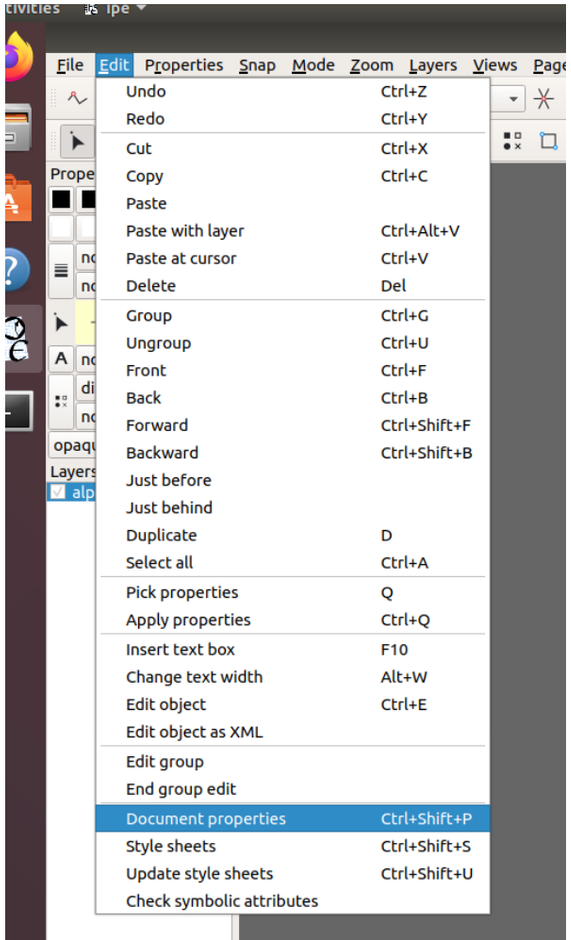
- An ipe File has a preamble for packages, definitions, newcommands etc.



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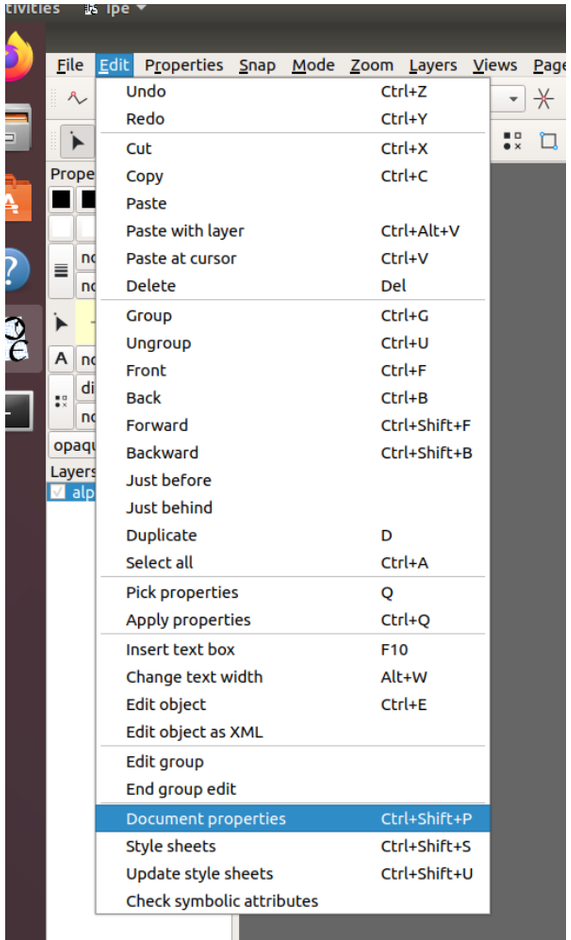
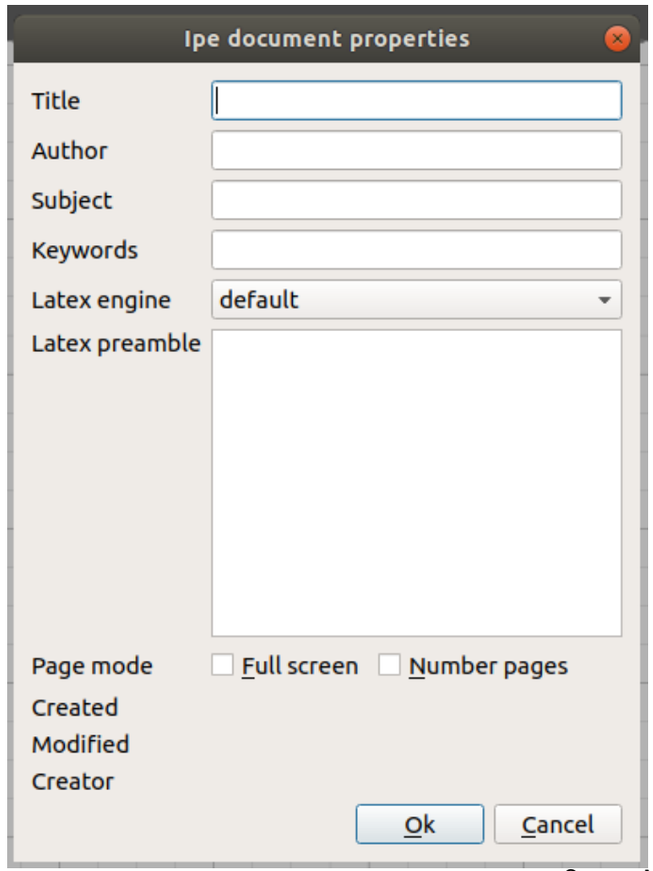
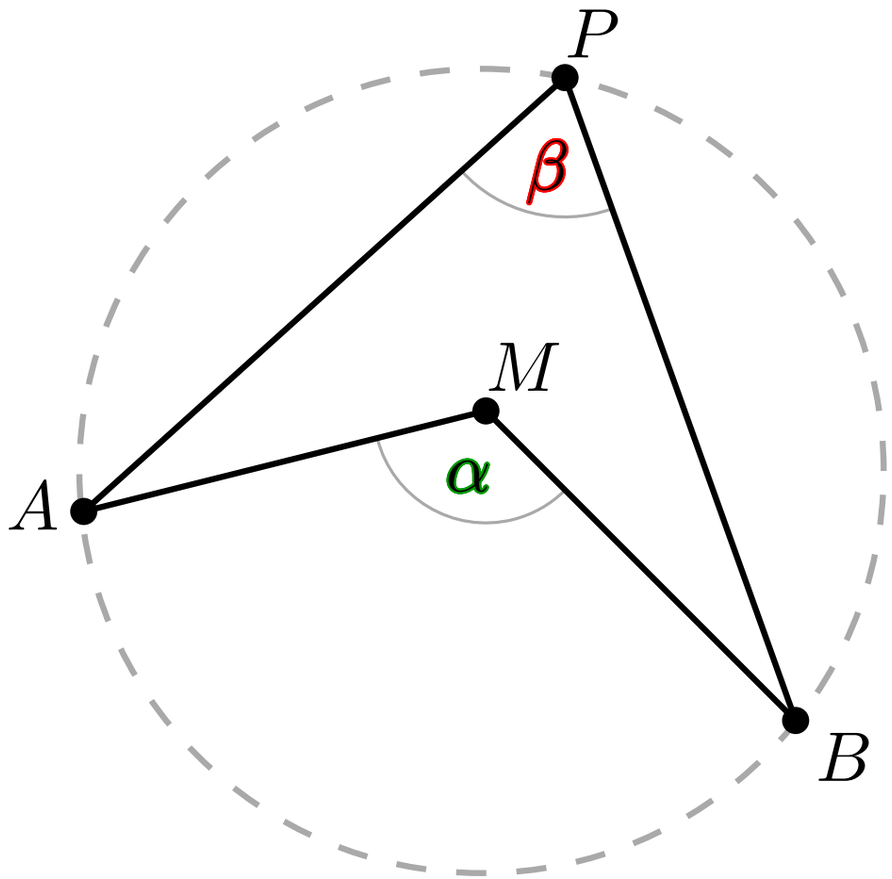




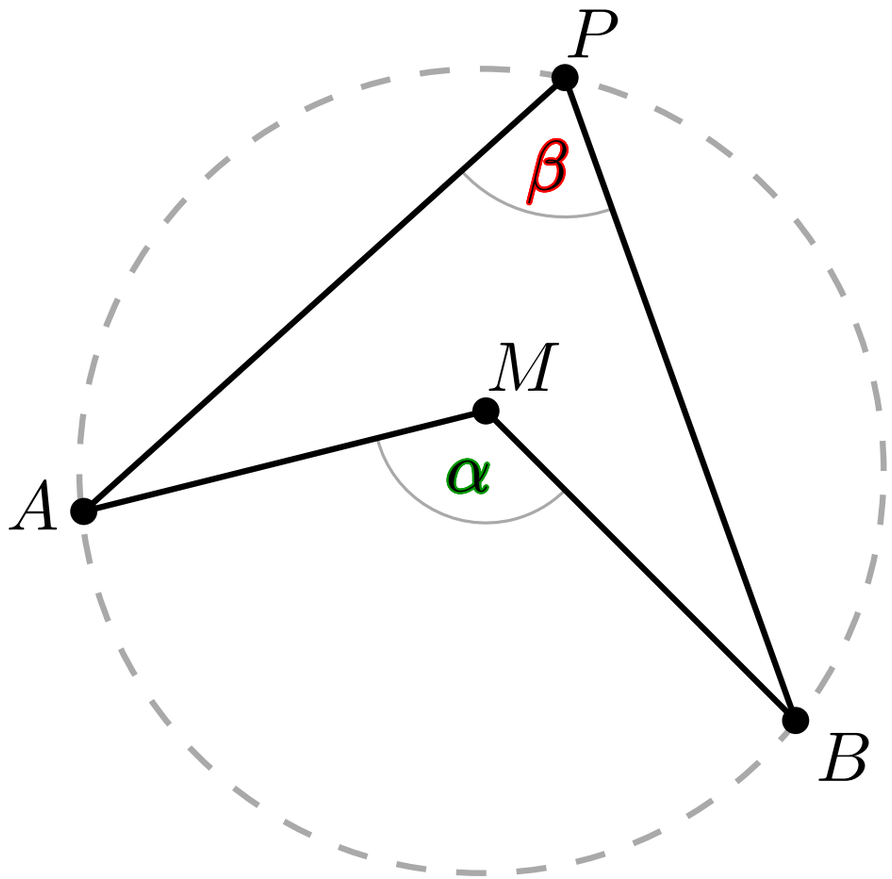
Demo I.5



Theorem 1 *The angle at the midpoint M is double the size of the angle at P ($\alpha = 2\beta$)*

$\sim$ 2 minutes

Demo I.5



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Make this a theorem (environment)

$\sim$ 2 minutes

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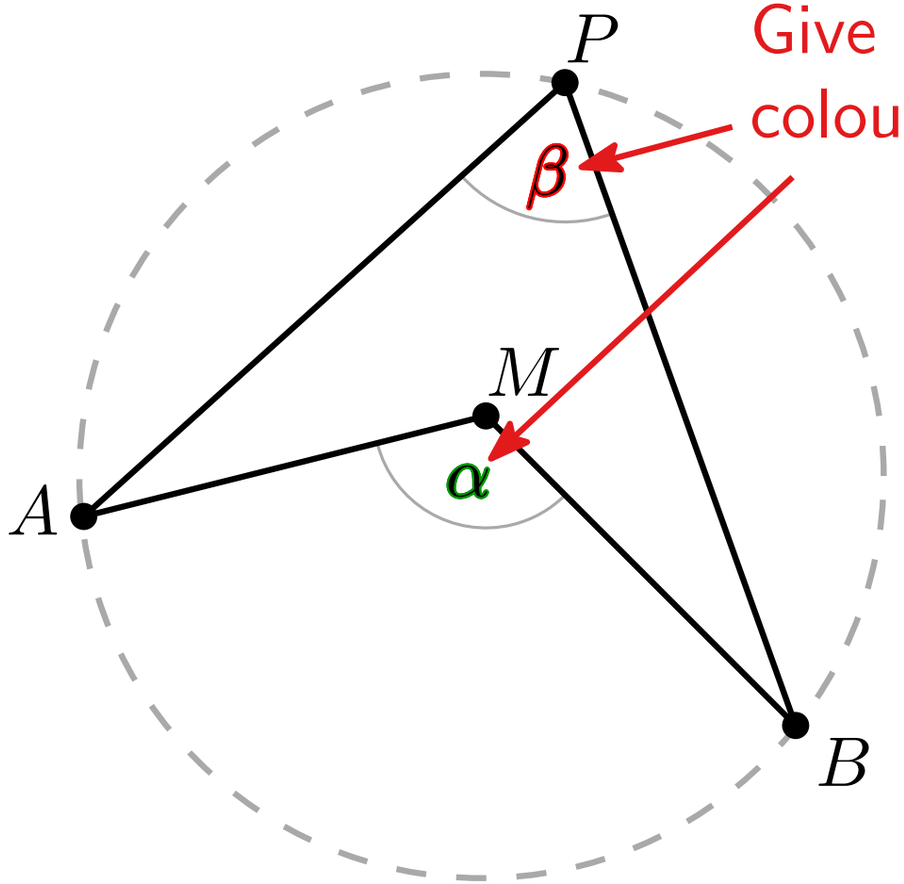


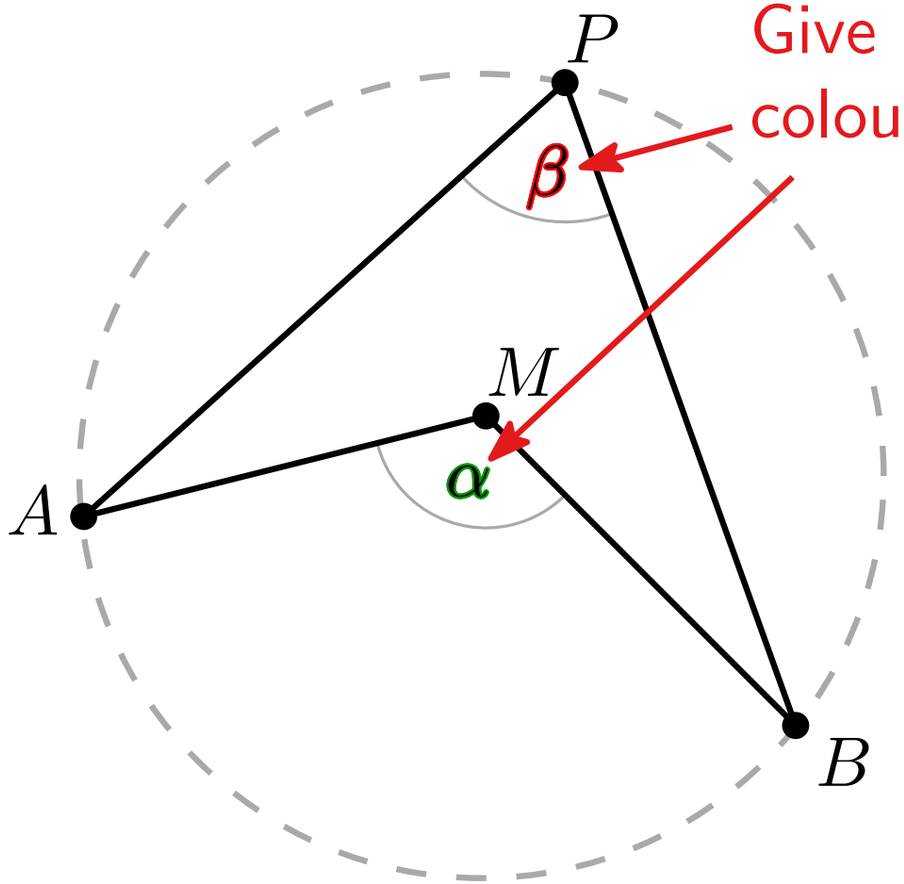
Give α and β a colour contour

Theorem 1 *The angle at the midpoint M is double the size of the angle at P ($\alpha = 2\beta$)*

Make this a theorem (environment)

$\sim$ 2 minutes

Demo I.5



Give α and β a colour contour

This is what you need

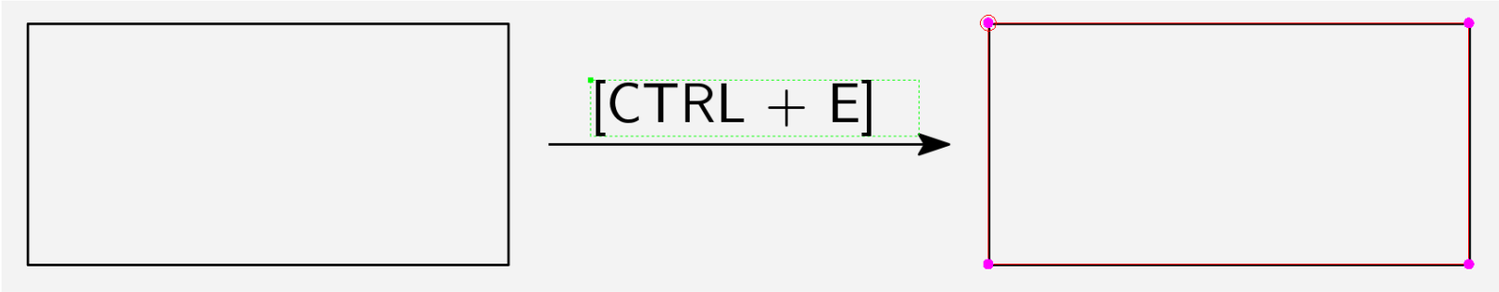
- `\usepackage{contour}`
- `\newtheorem{thm}{Theorem}`
- `\contour{COLOURNAME}{TEXT}`
- `\begin{thm} [...]`
  `\end{thm}`

Theorem 1 *The angle at the midpoint M is double the size of the angle at P ($\alpha = 2\beta$)*

Make this a theorem (environment)

$\sim$ 2 minutes

Edit Mode



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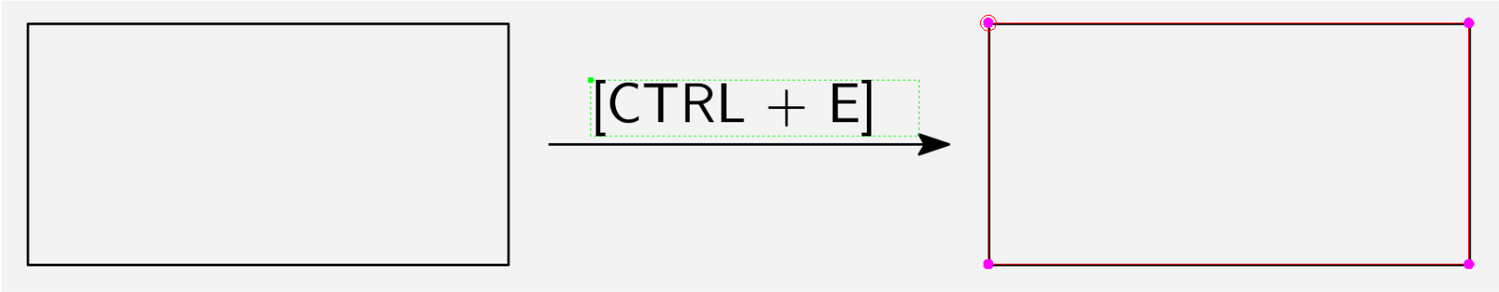

In edit mode you can:

- **Move** vertices of polygons/control points of bezier curves independently
- **Cut** polygons at vertices $\rightarrow$ polyline
- **Cut** polylines at vertices $\rightarrow$ 2 sub-paths, STILL 1 object (!)
- **Duplicate** and **delete** vertices/control points

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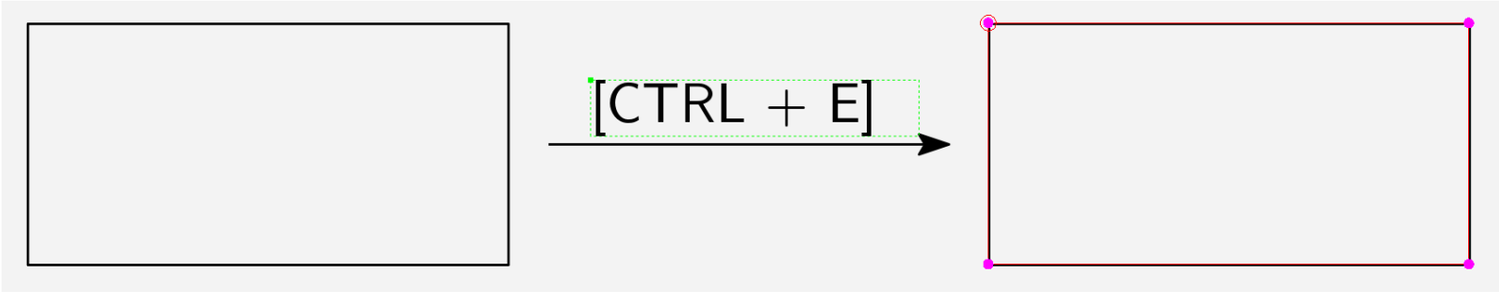

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Group objects to move, rotate, scale them as one

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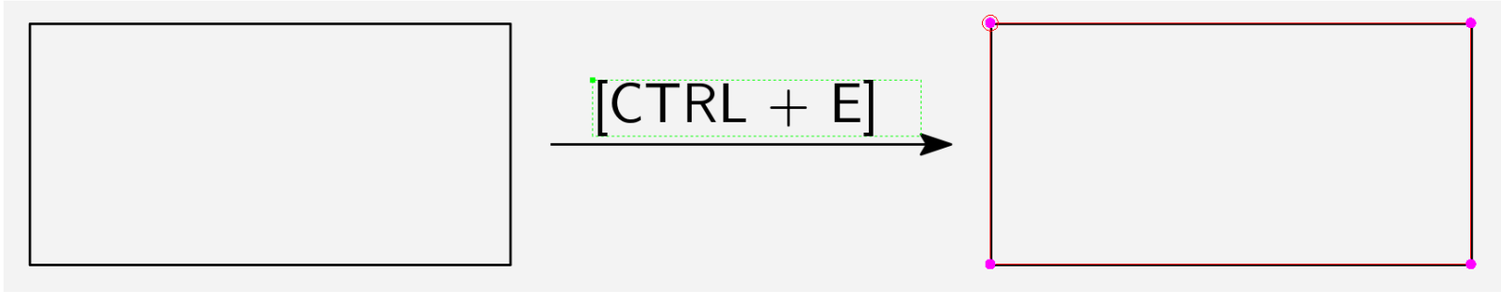

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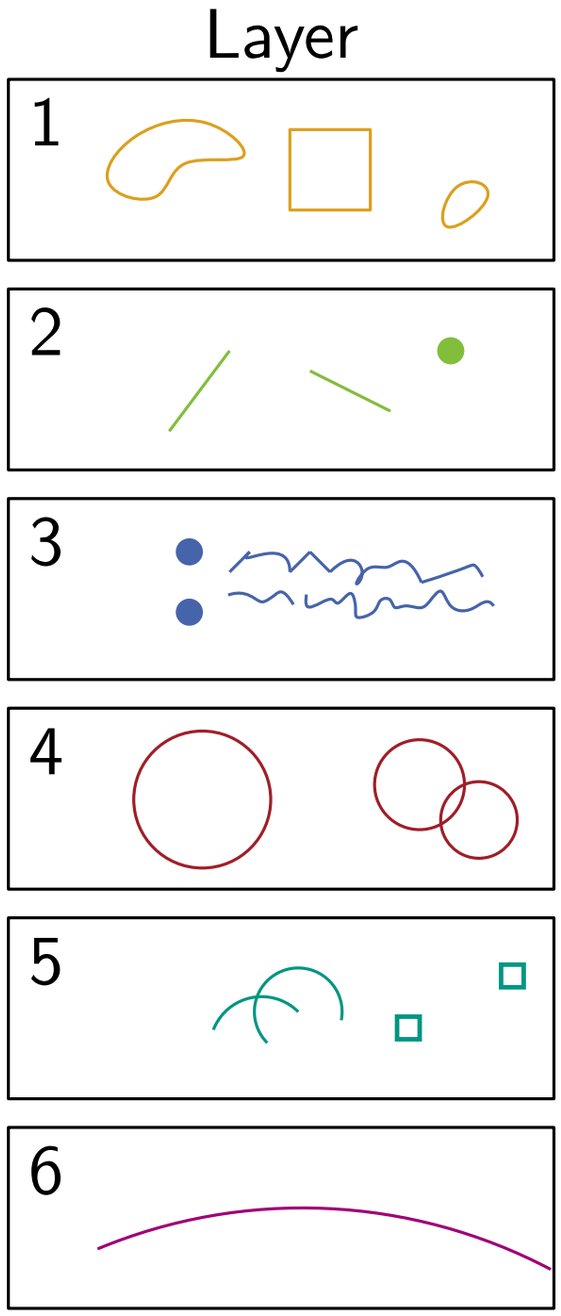
How does Ipe think?

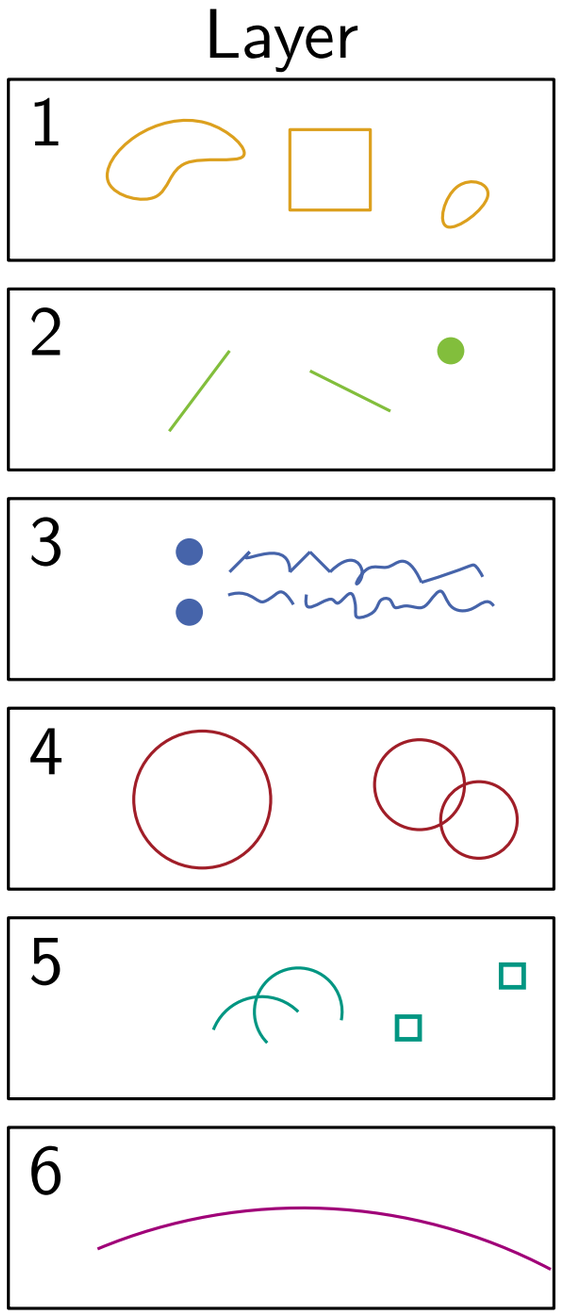
- Transformation tools change the appearance of an object (theres a transformation matrix for these).
- Edit mode changes its structure (number of vertices and the like).

Layers, Views & Pages



- Every object lies on exactly **one** layer

Layers, Views & Pages



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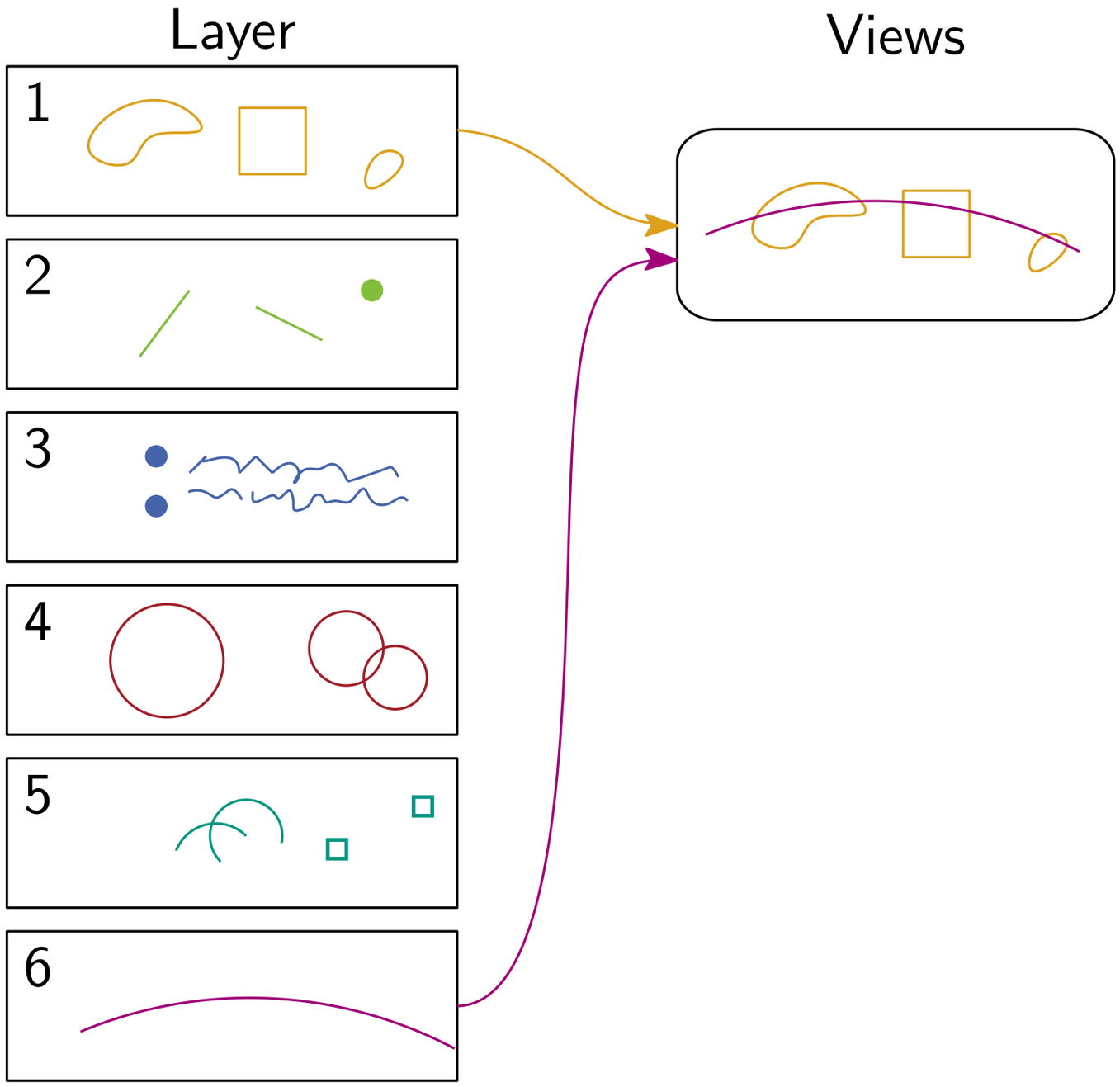
How does Ipe think?
Layers and Z-Order are not related!
Different from Photoshop etc.

Layers, Views & Pages



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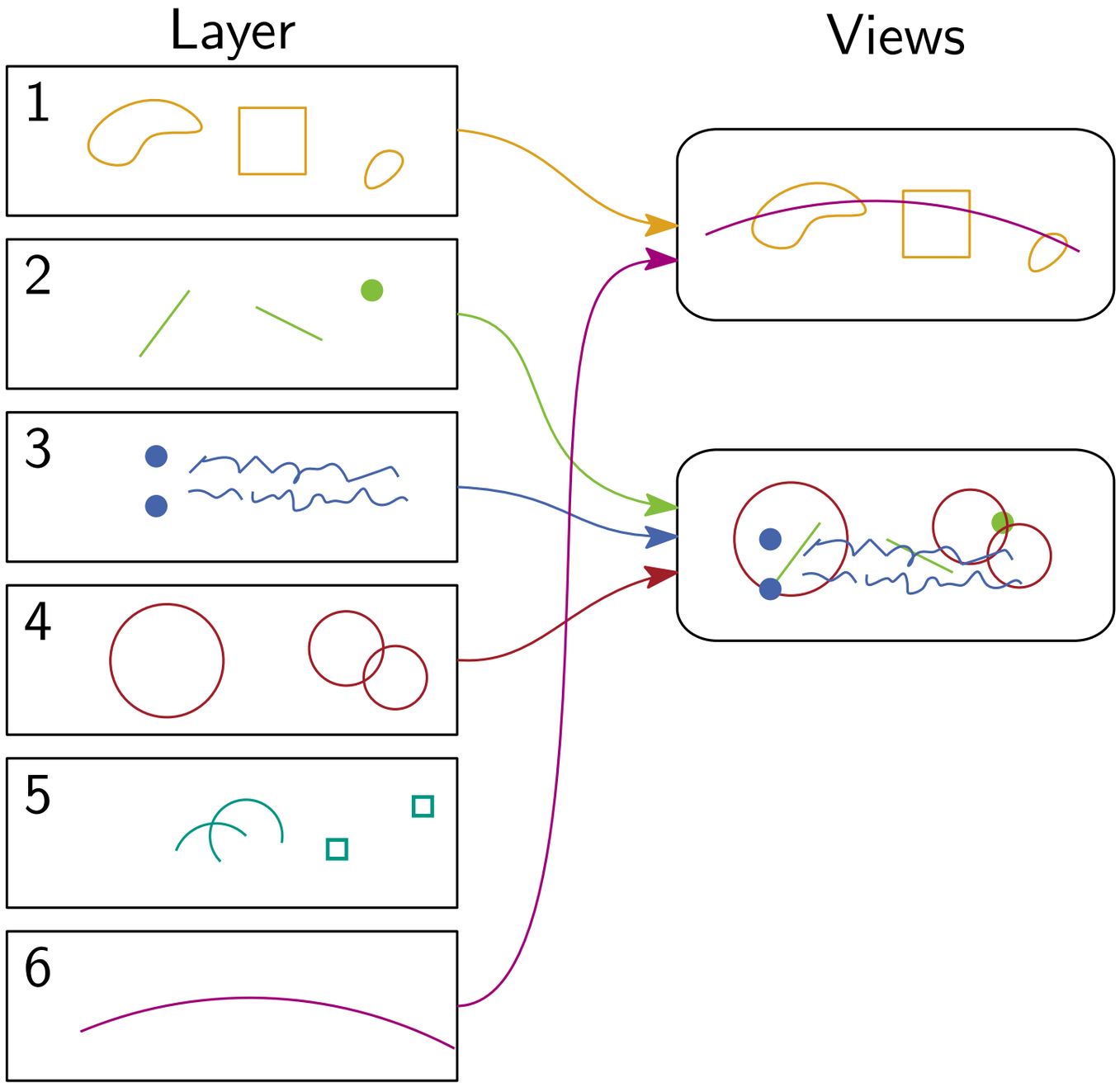
Layers, Views & Pages



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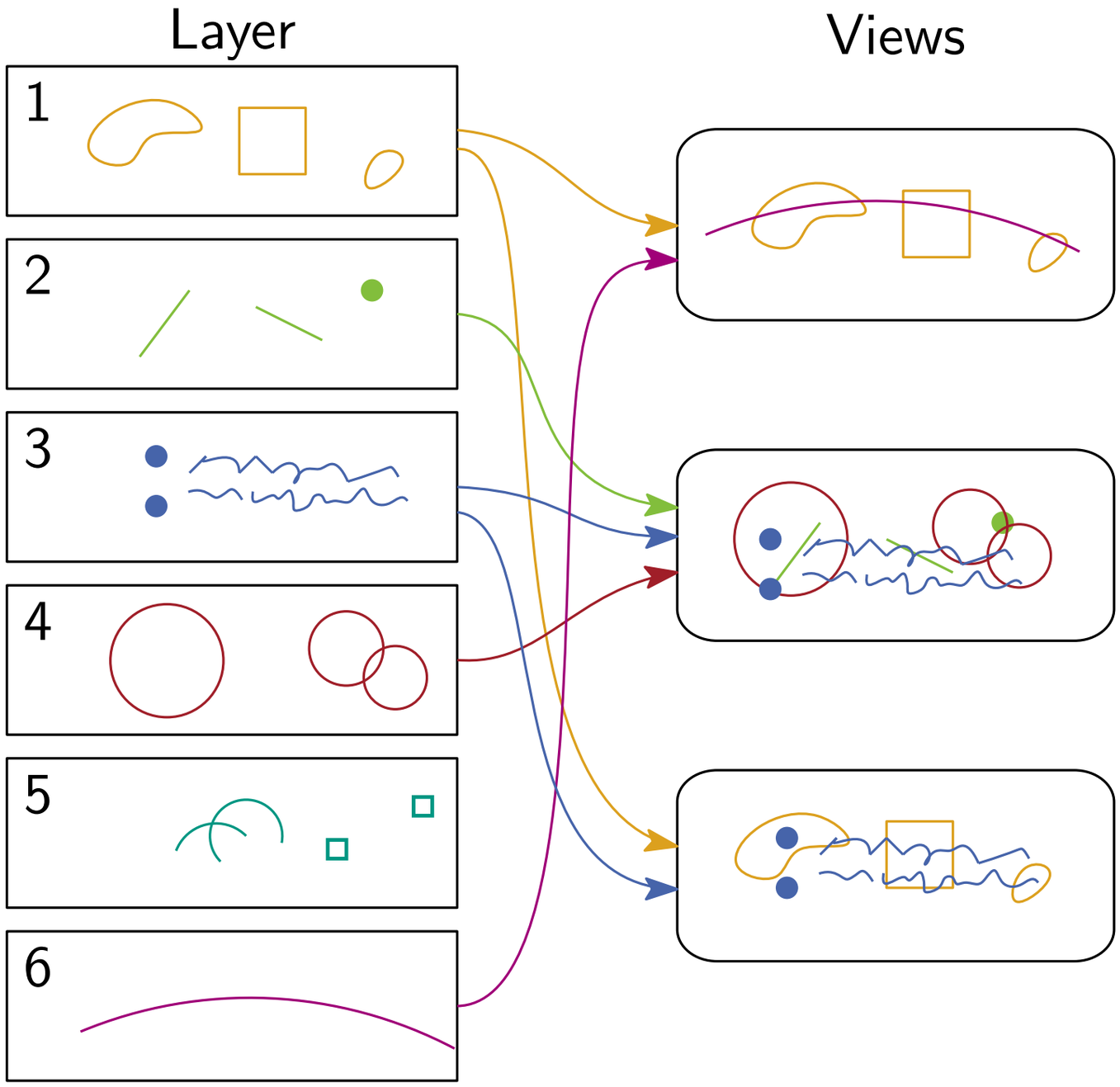
Layers, Views & Pages



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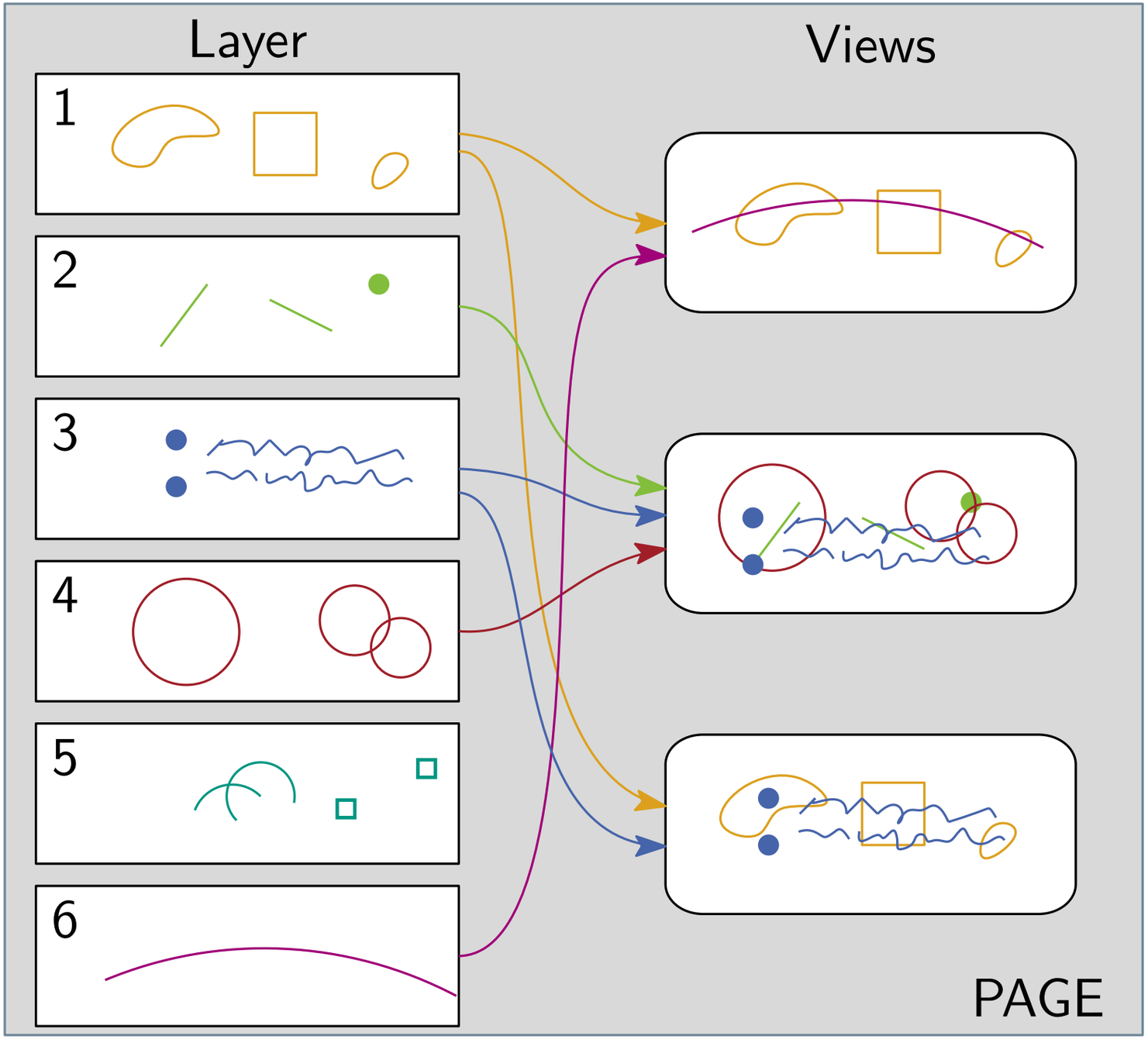
Layers, Views & Pages



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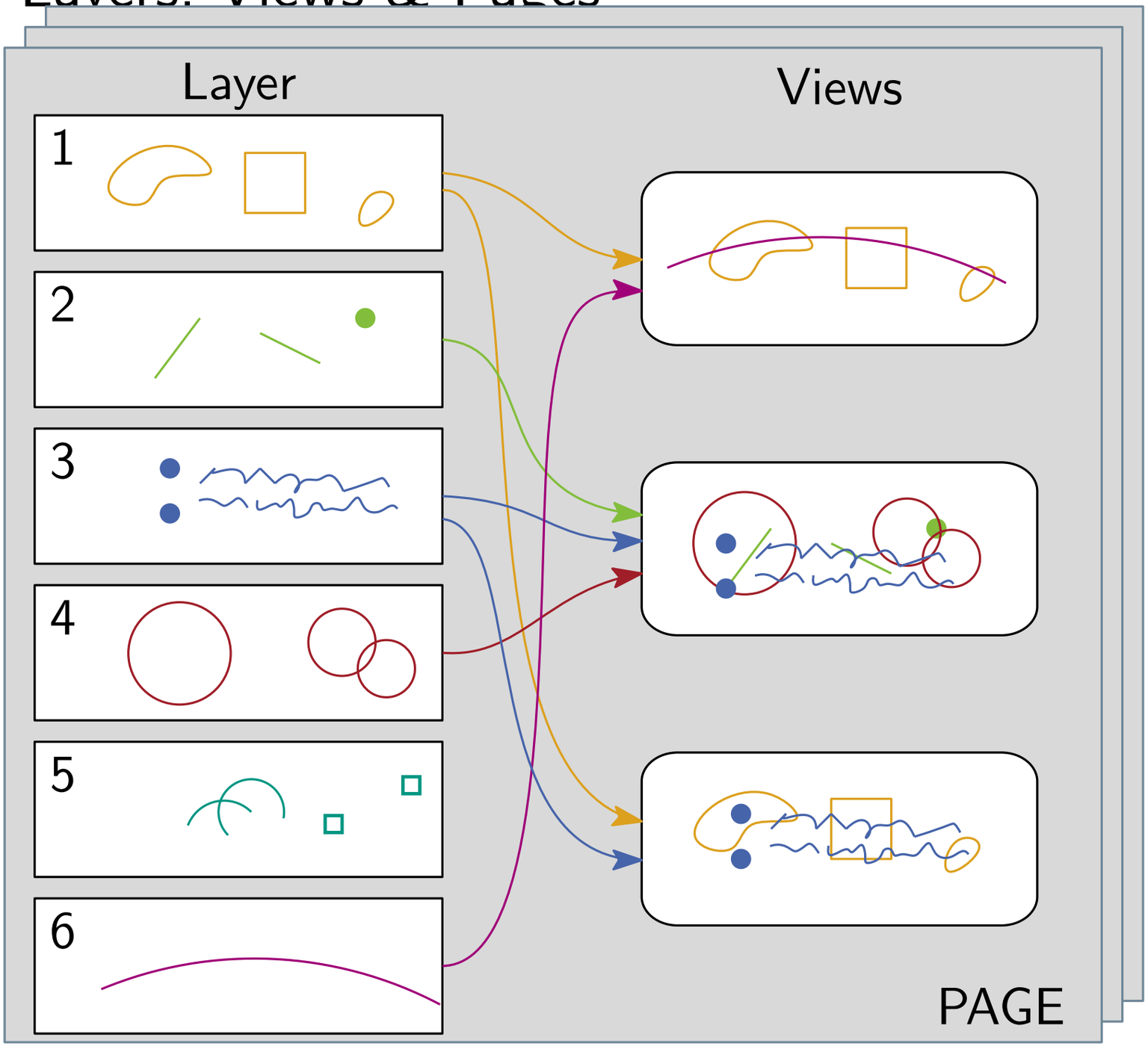
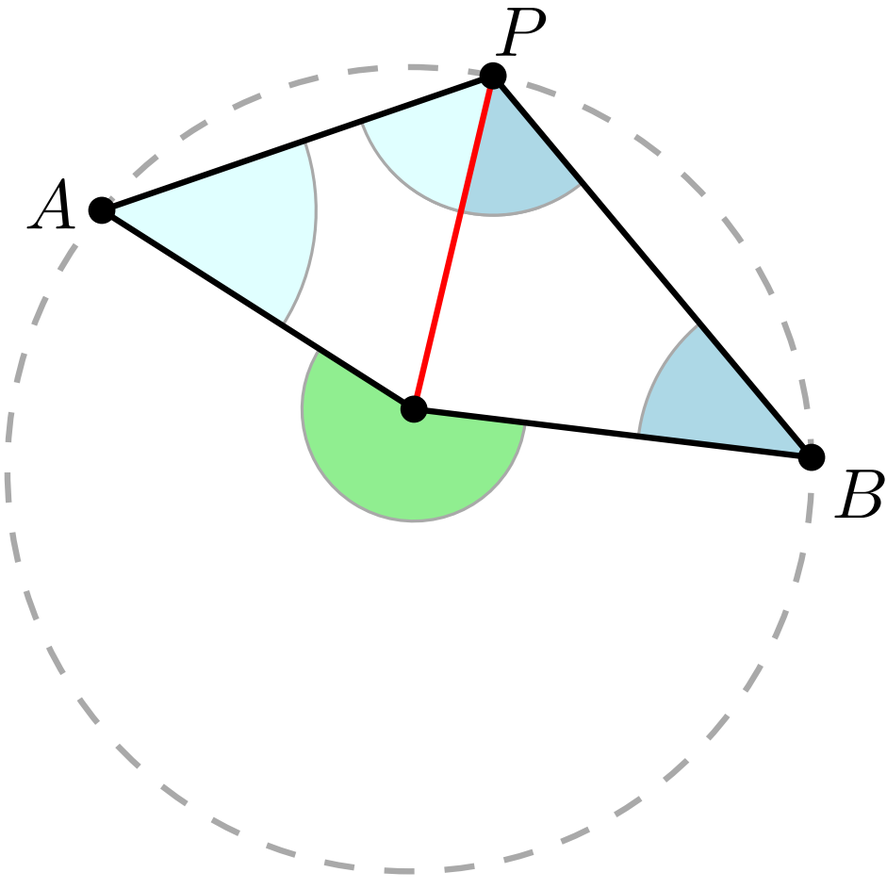
Layers, Views & Pages



- Every object lies on exactly **one** layer
- Every view can show any number and combination of layers
- All layers and views belong to one page
- One document can have many pages
- Use for variations on figures or animations in presentations

Demo II

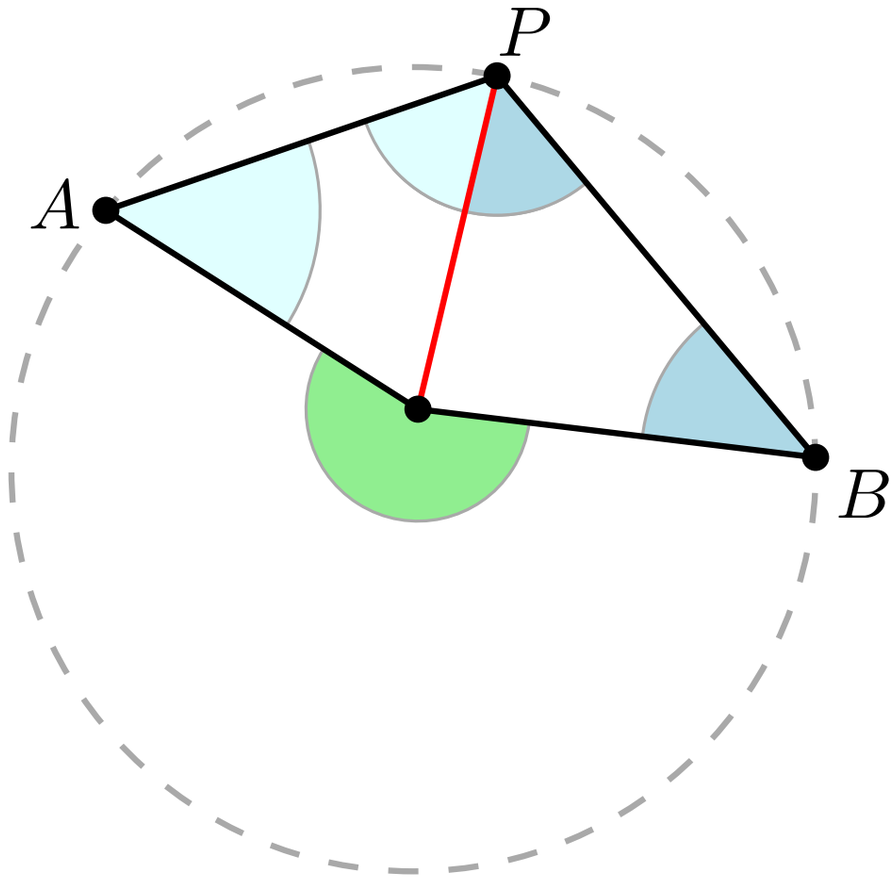
1. Create 2 new views with a new layer each ([CTRL + SHIFT + I])



$\sim$ 5+ minutes

Demo II

1. Create 2 new views with a new layer each ([CTRL + SHIFT + I])
2. Leave things, which are in both images on the first layer. Move the rest to the second layer.



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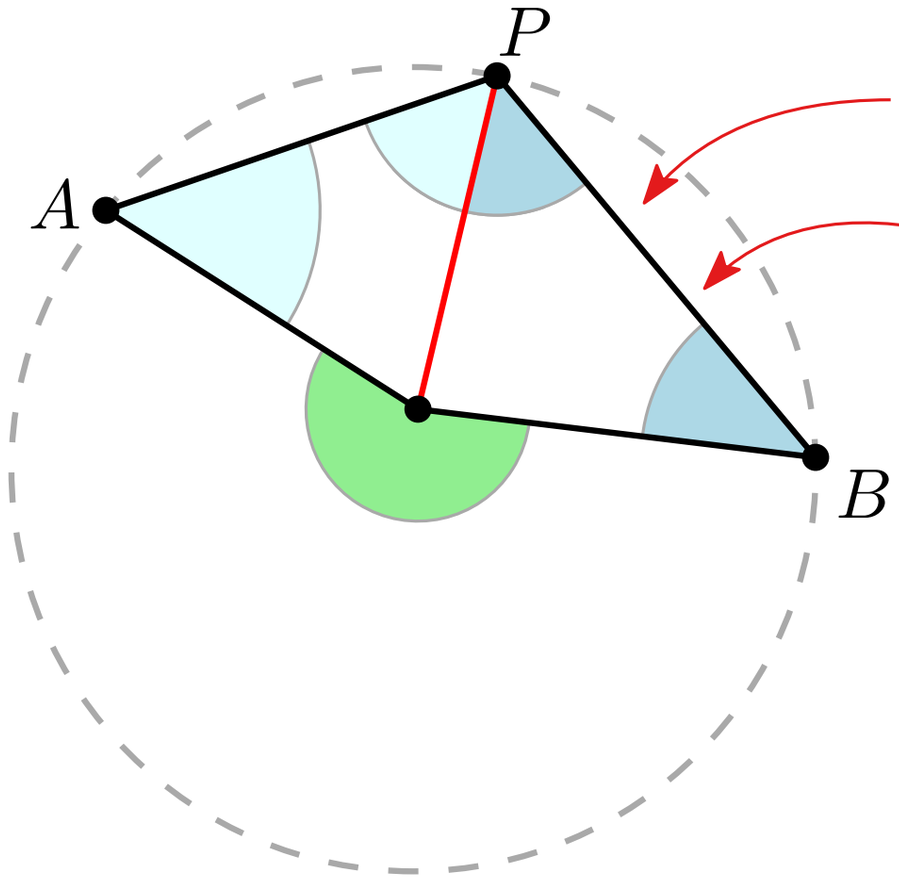

3. Copy quadrilateral to third layer and use edit mode to change the shape of the quadrilateral (where do you need to snap?)
   [CTRL + E] → Edit mode

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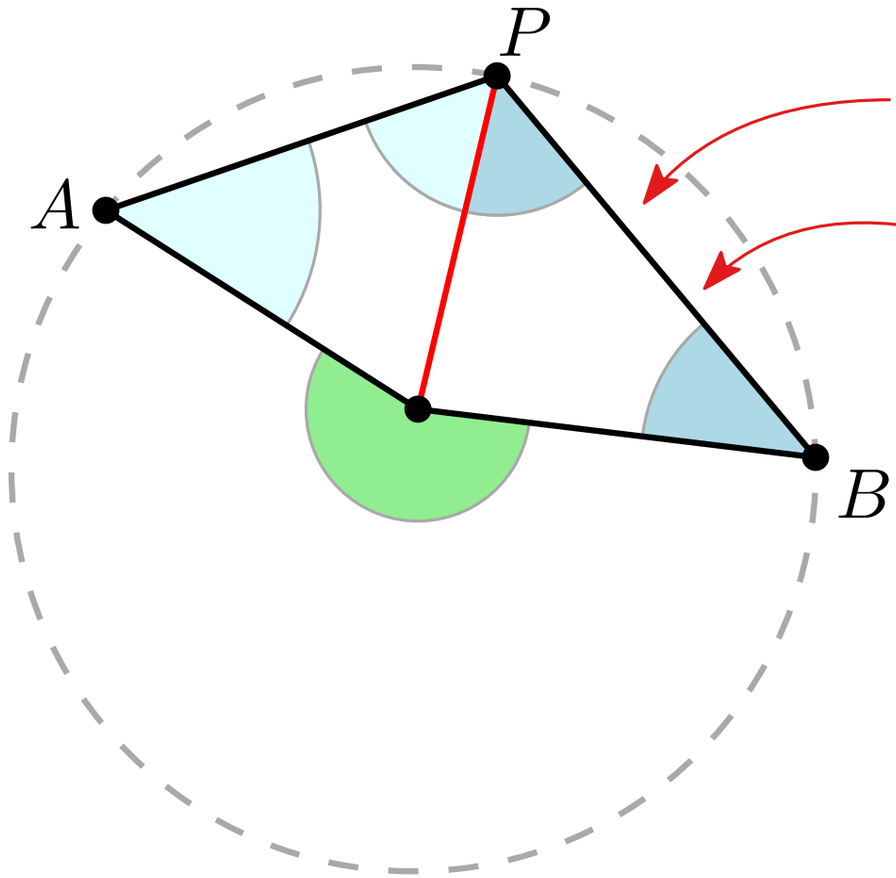

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Bonus:

- Use join to create “angle pizza slices” (what are the basic components?)
- Add styling

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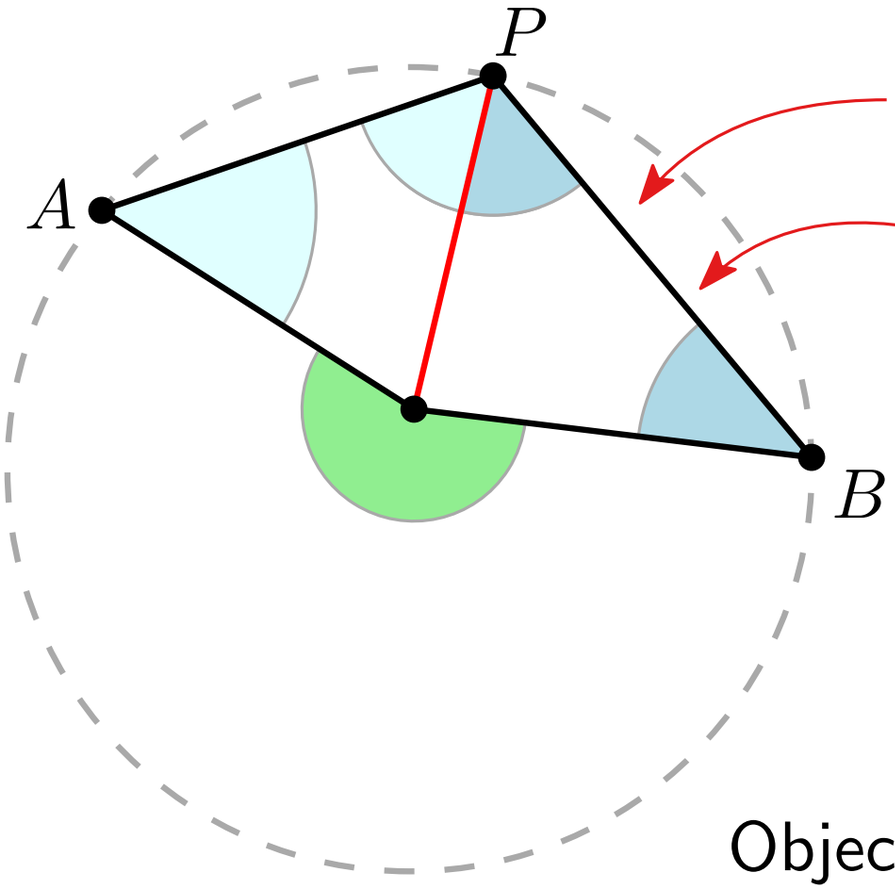

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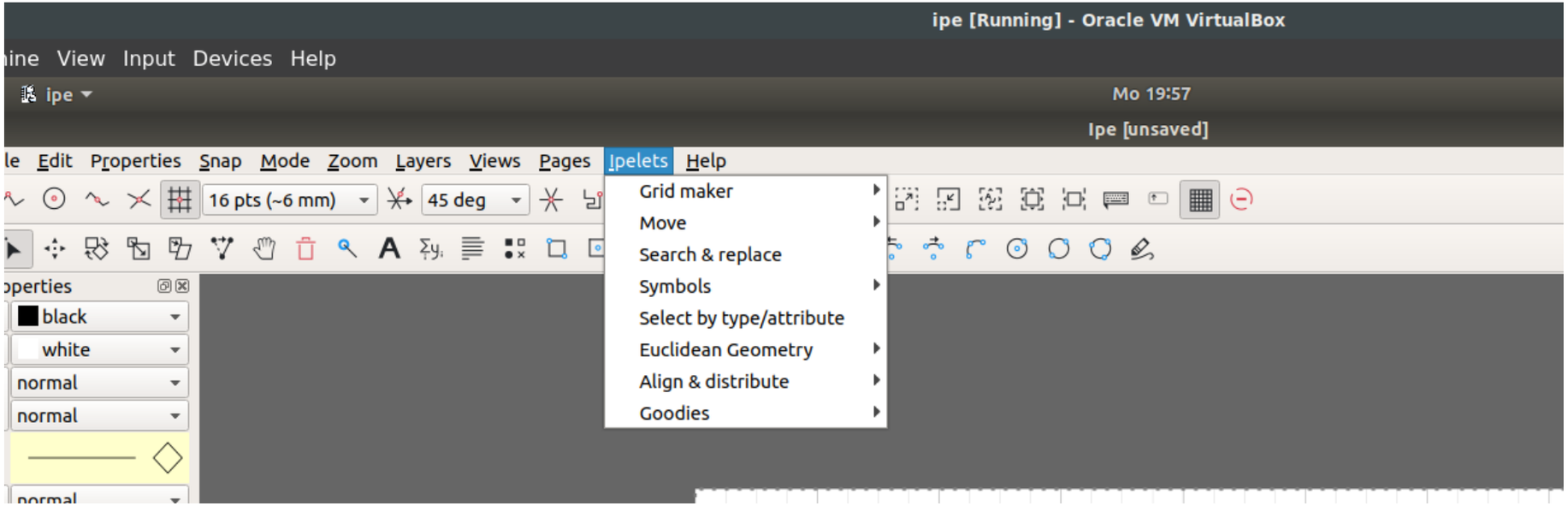
Objects are added to highlighted layer (click on layer name to change)

$\sim$ 5+ minutes

Ipelets

- Plugins written in Lua (like IPE itself)



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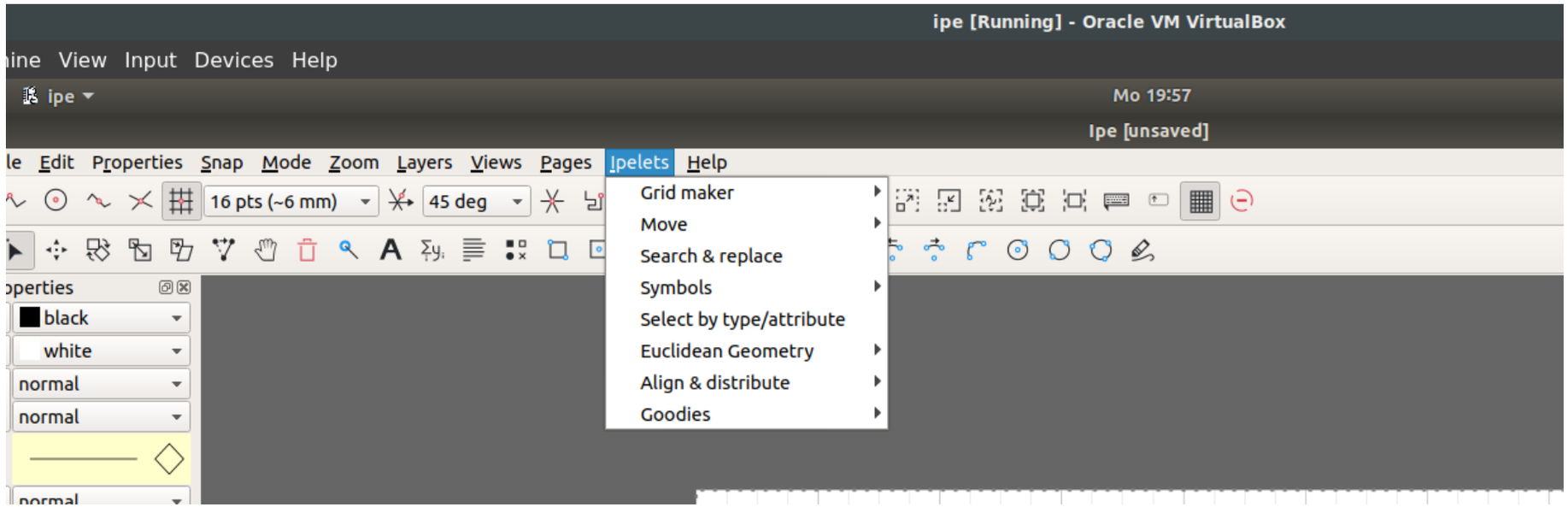

- handy and often used functions (align, center, distribute, move objects)
- very specific functionality (Voronoi Diagrams/Delaunay Triangulations)
- Utility functions (triangular/custom grids)
- geometric features (mirroring, generating regular k-gons, incircles, etc.)

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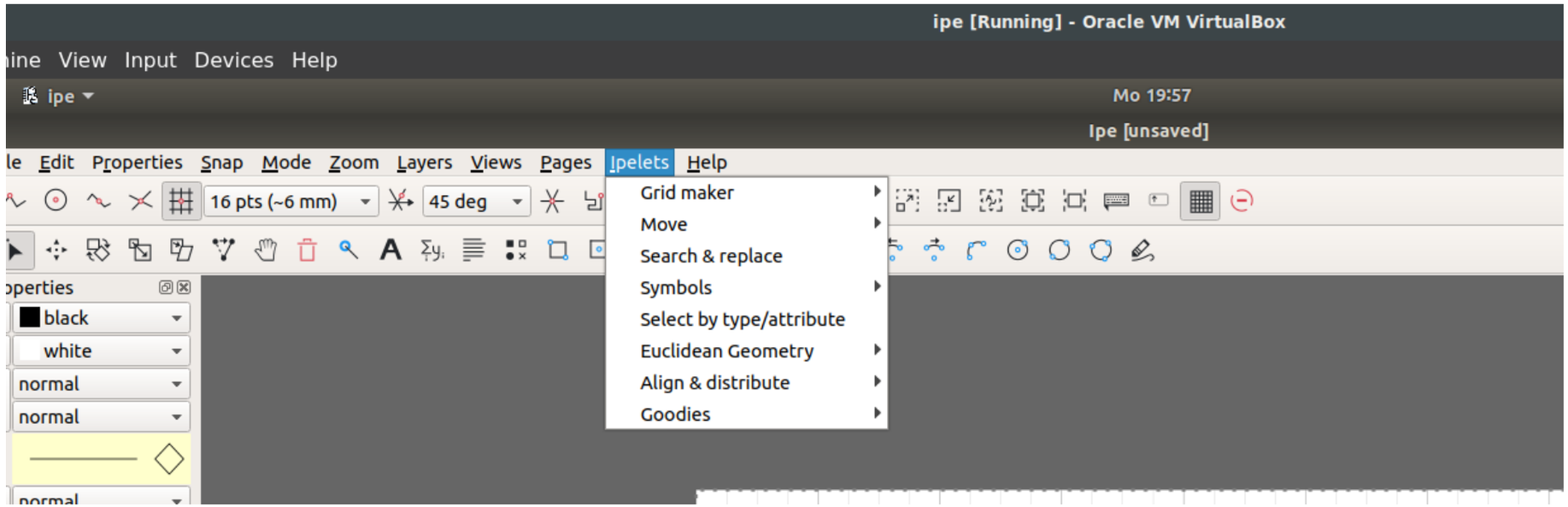

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- very specific functionality (Voronoi Diagrams/Delaunay Triangulations)
- Utility functions (triangular/custom grids)
- geometric features (mirroring, generating regular k-gons, incircles, etc.)
- There is a CGAL ipelet (this is advanced in setup and usage)

Tipps, Trick & Space for Notes

- **[F10]** gives you a box spanning the whole page, useful for presentations
- templates for presentations exist
- Pagenumbers are built into ipe (but sometimes tricky)
- Decorations ipelet allows for automatically boxed text
  (I haven't checked compatibility for some versions)

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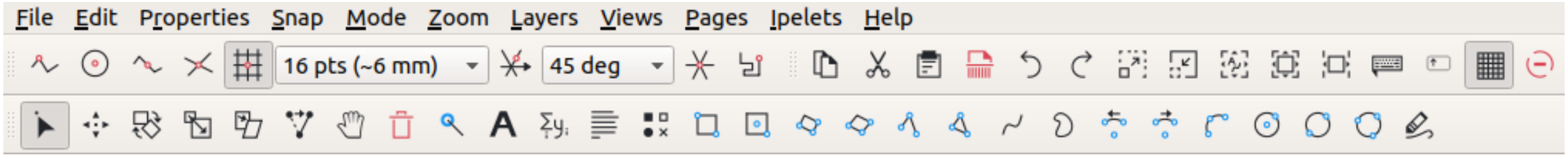
- Almost everything you see can be changed through style-files

The Tools [EXTENDED VERSION]



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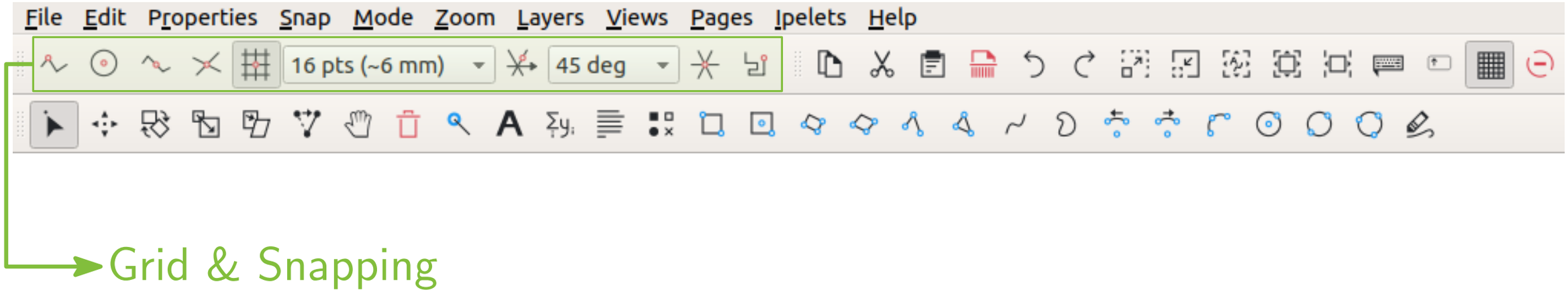

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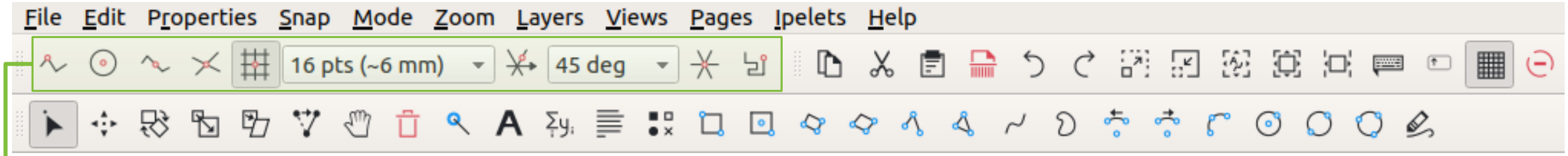
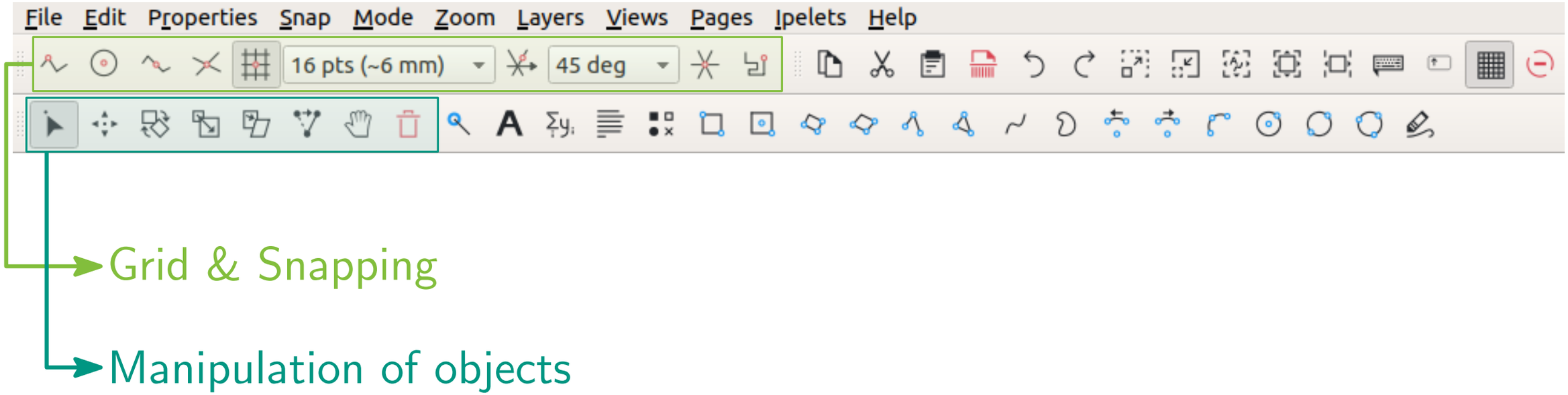


Grid & Snapping

- Grid
- Intersection
- Lines
- Centers (Objects), Corners of Text
- Enpoints & Marks

The Tools [EXTENDED VERSION]



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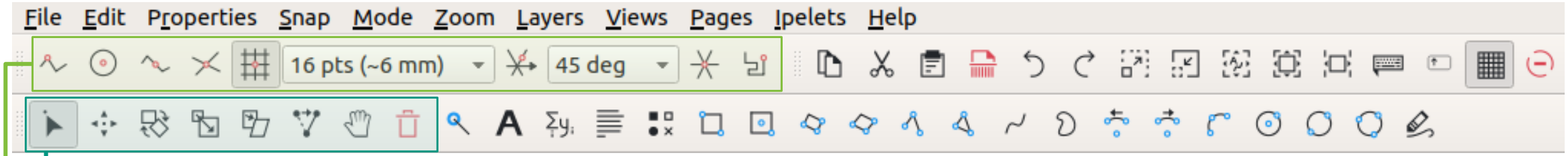
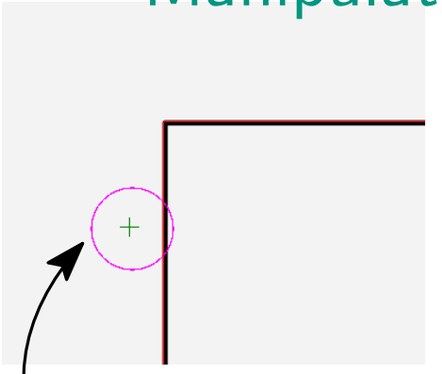


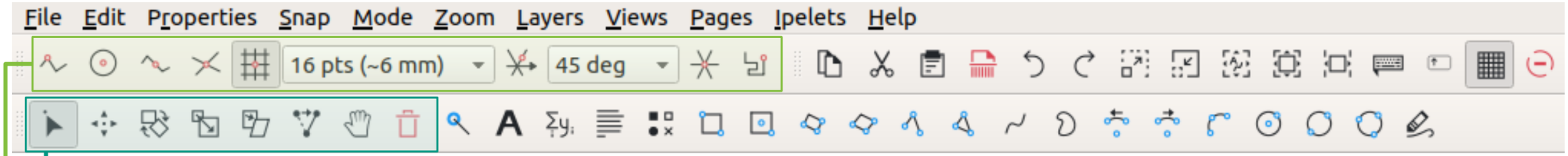
Grid & Snapping

Manipulation of objects



Theres a radius of selection

The Tools [EXTENDED VERSION]



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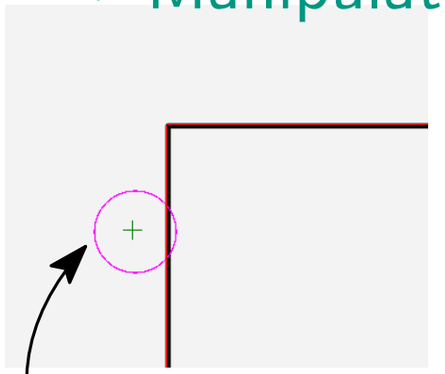

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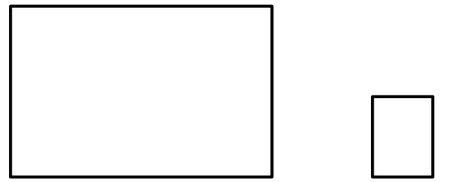

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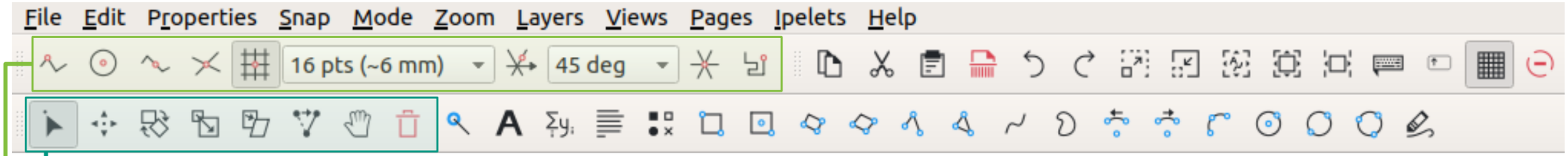

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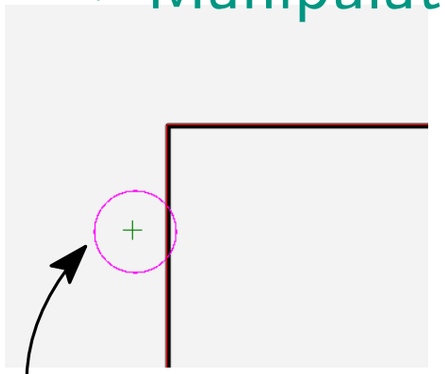

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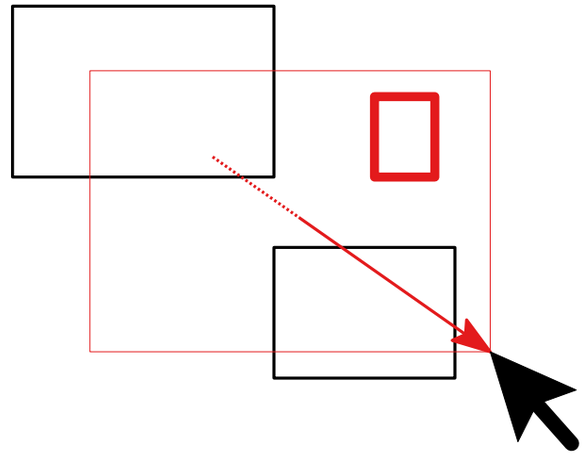

left $\rightarrow$ right $\Longrightarrow$ select included

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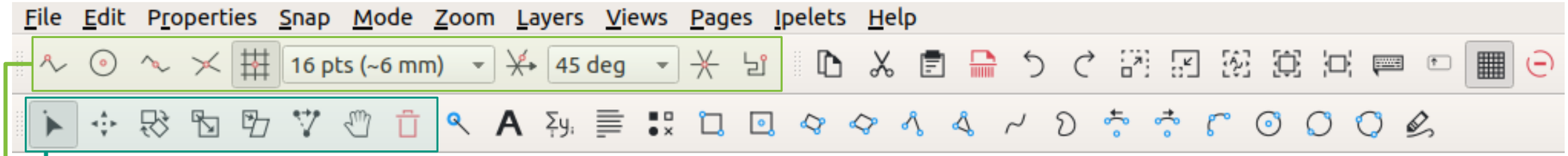

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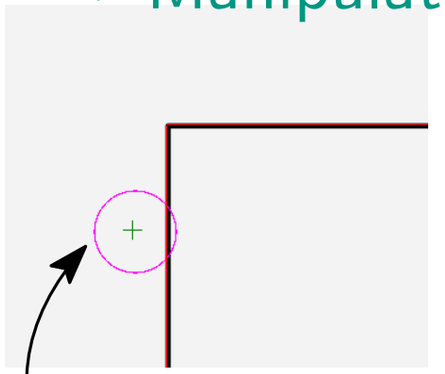

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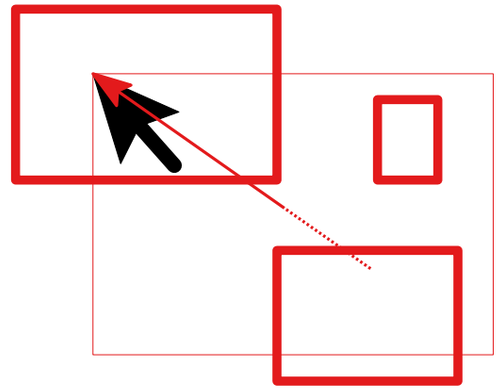
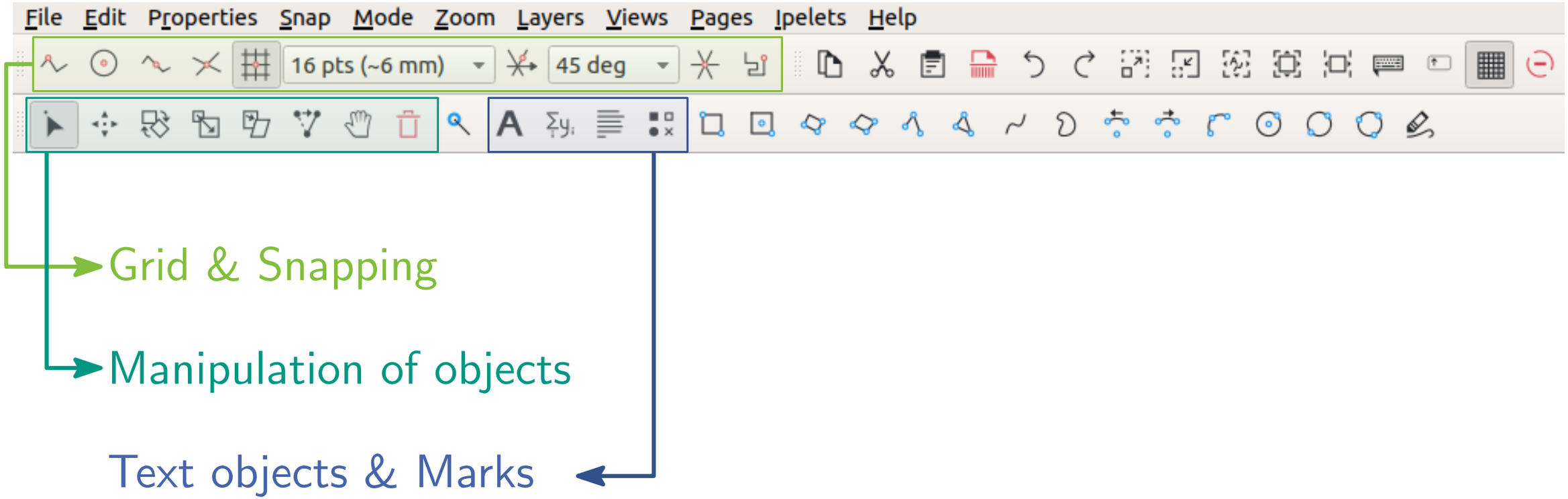


left $\rightarrow$ right $\Longrightarrow$ select included

right $\rightarrow$ left $\Longrightarrow$ select intersected

The Tools [EXTENDED VERSION]



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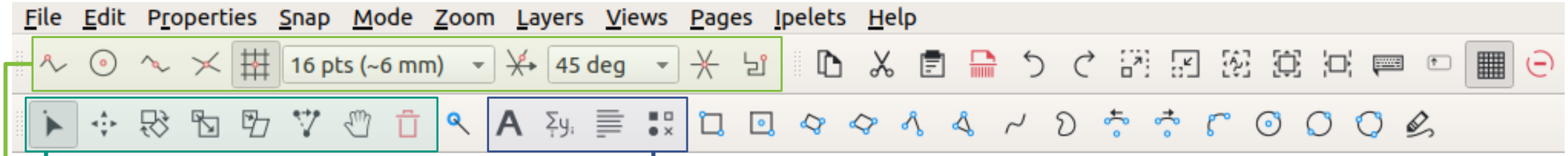
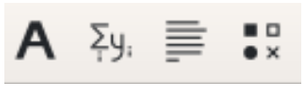


Grid & Snapping

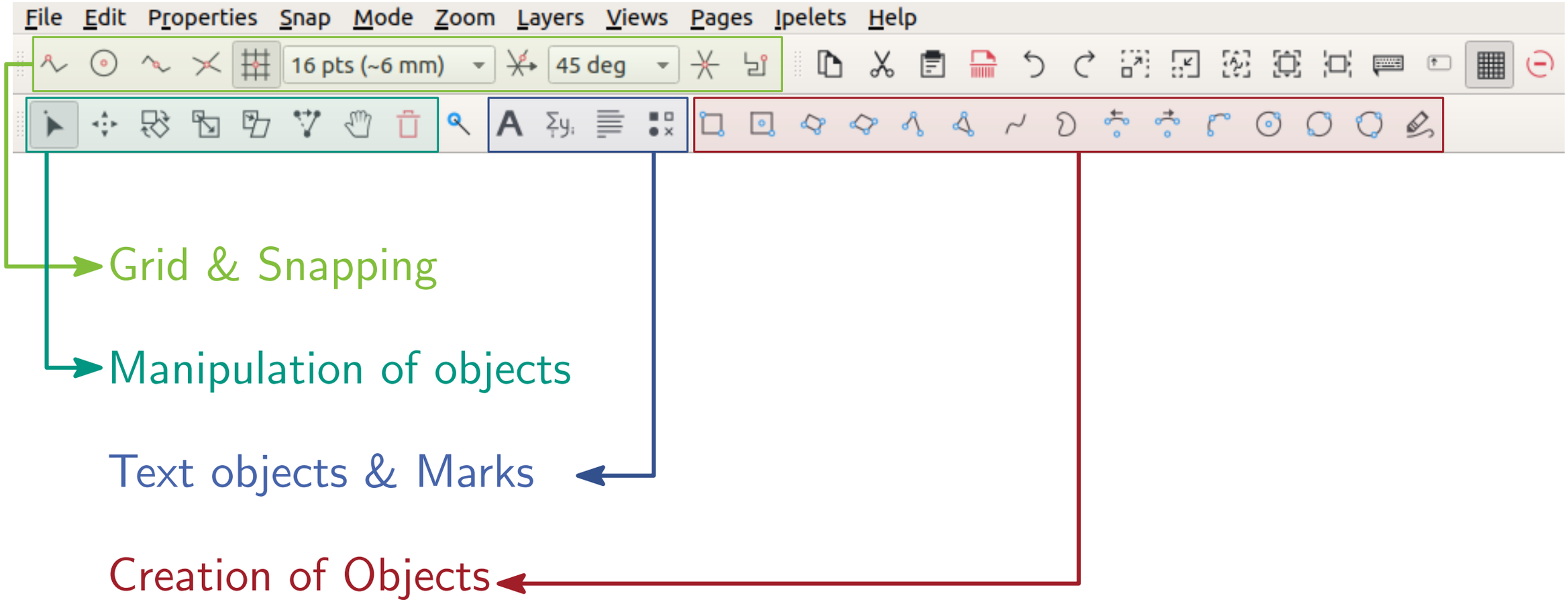
Manipulation of objects

Text objects & Marks



- Minipage (multiline, fixed width)
- Just adds $ [TEXT] $ to label
- Meant for labels in figures (no Linebreaks, some commands don't work, adaptive width)

The Tools [EXTENDED VERSION]



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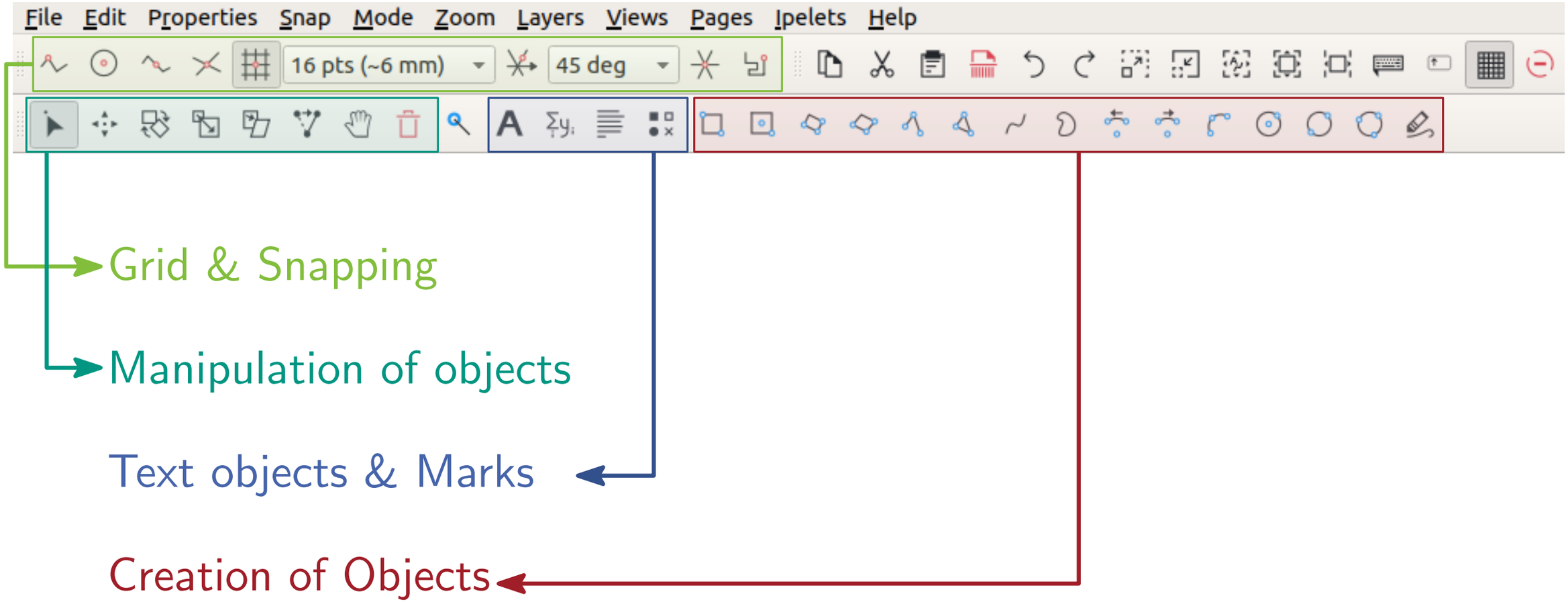

1. Rectangle by opposing corners
2. Polylines/-gons, Curves
3. Circle by center and size
4. Circle segments by center, start, end

The Properties [EXTENDED VERSION]

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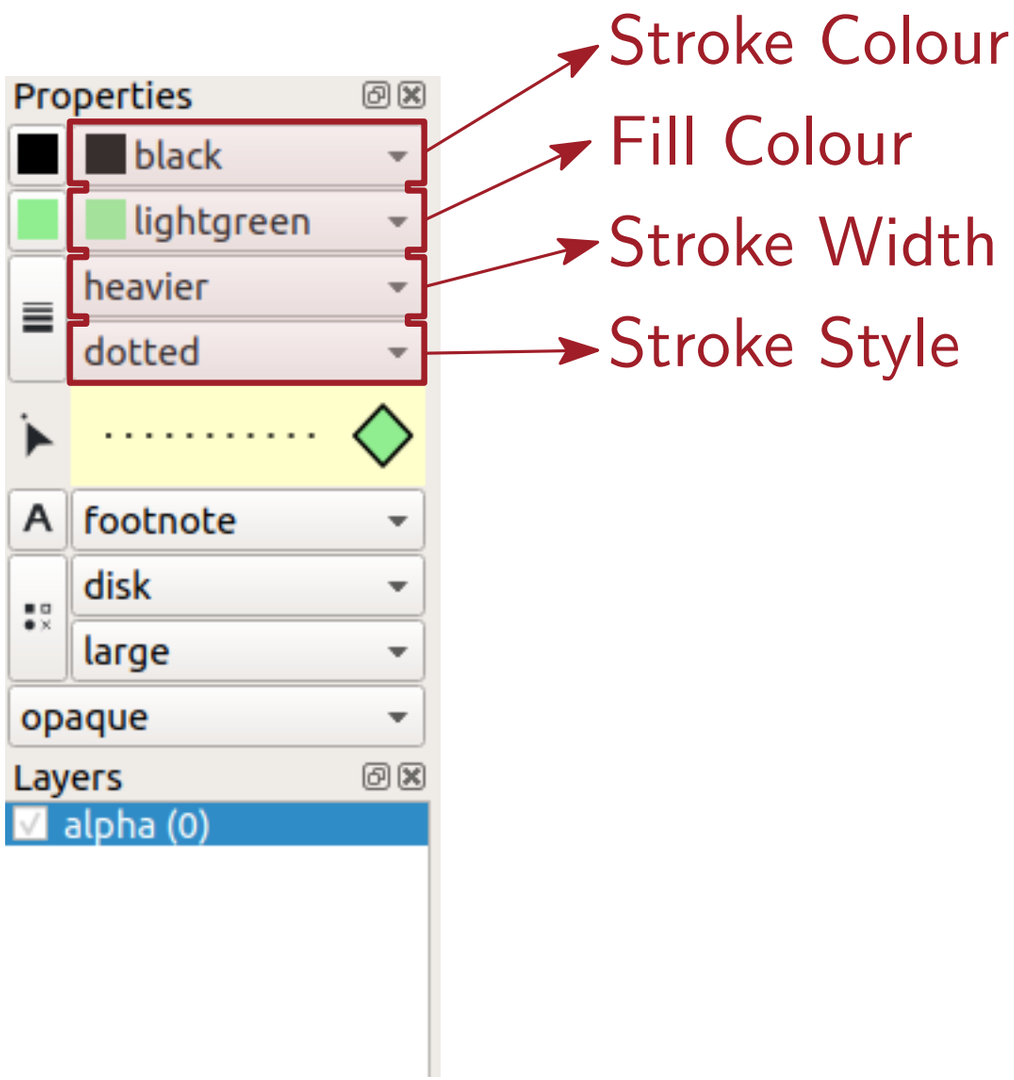

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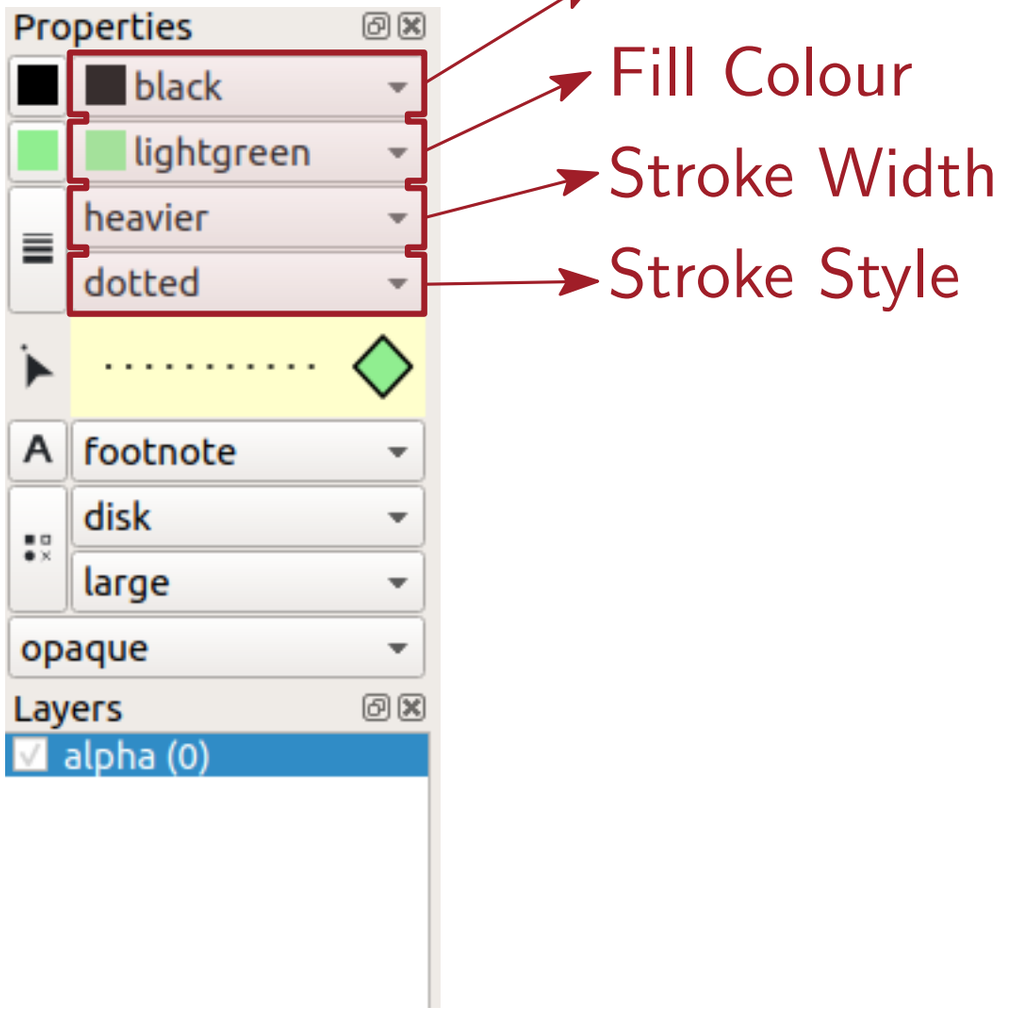

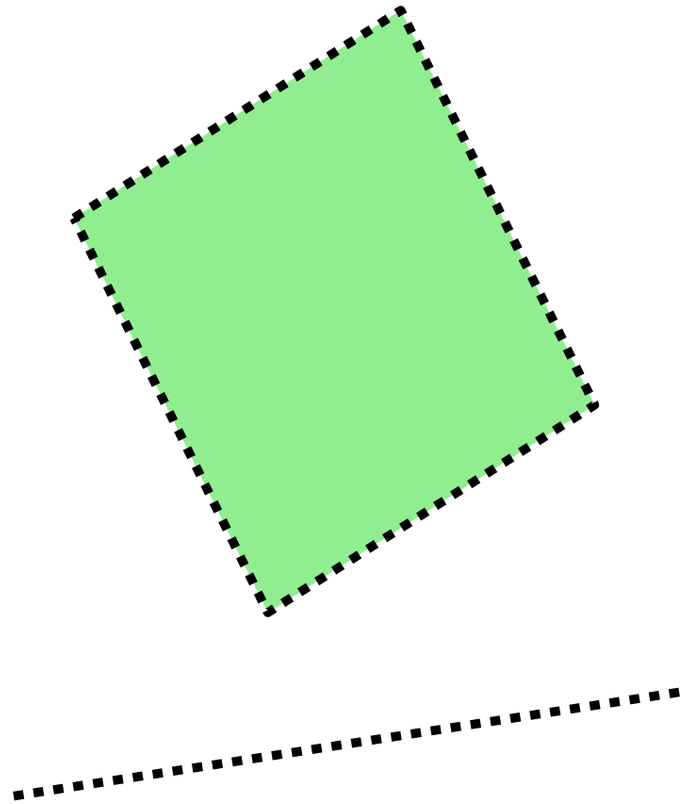

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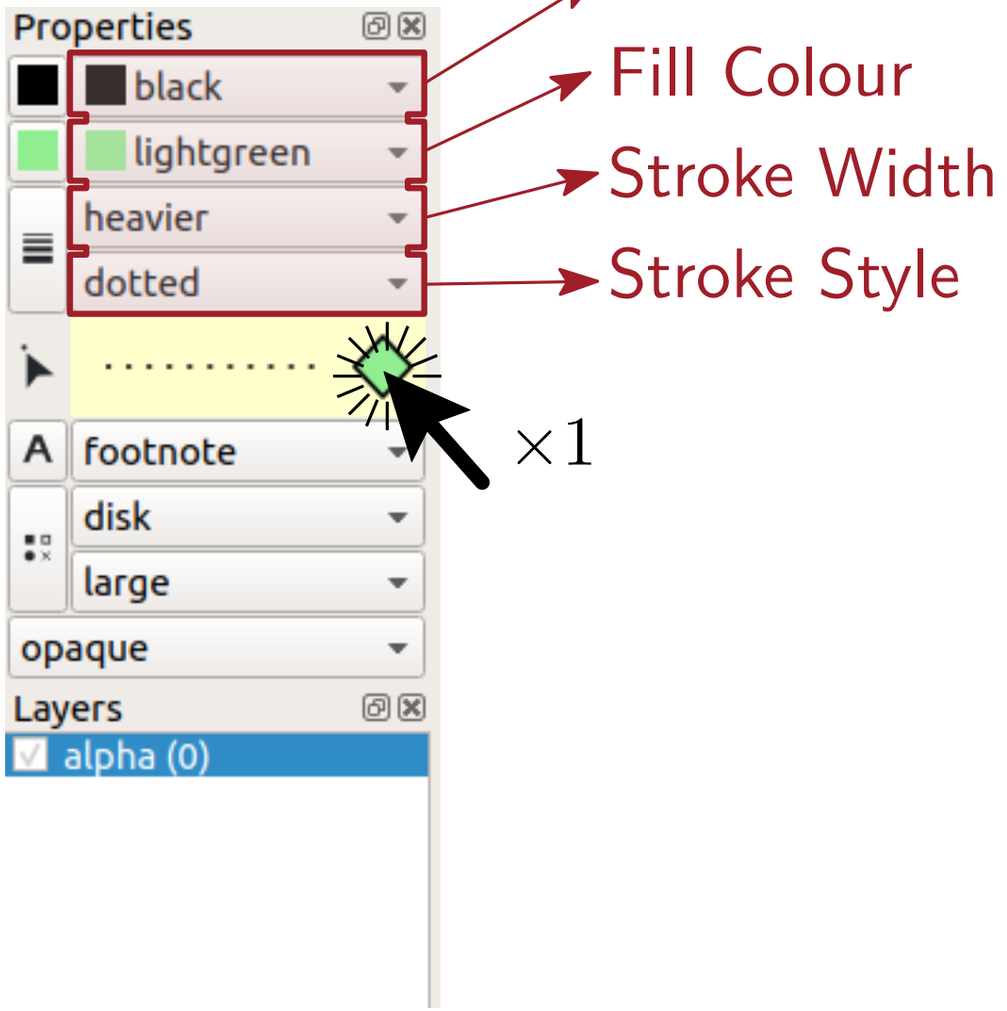

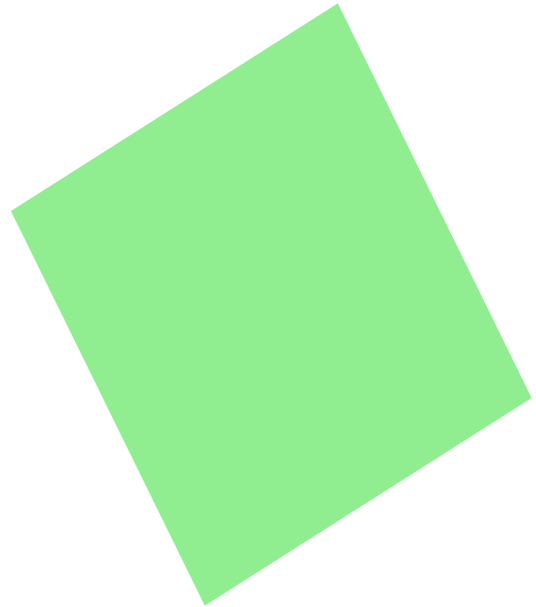

(Line is still there, but without contour)

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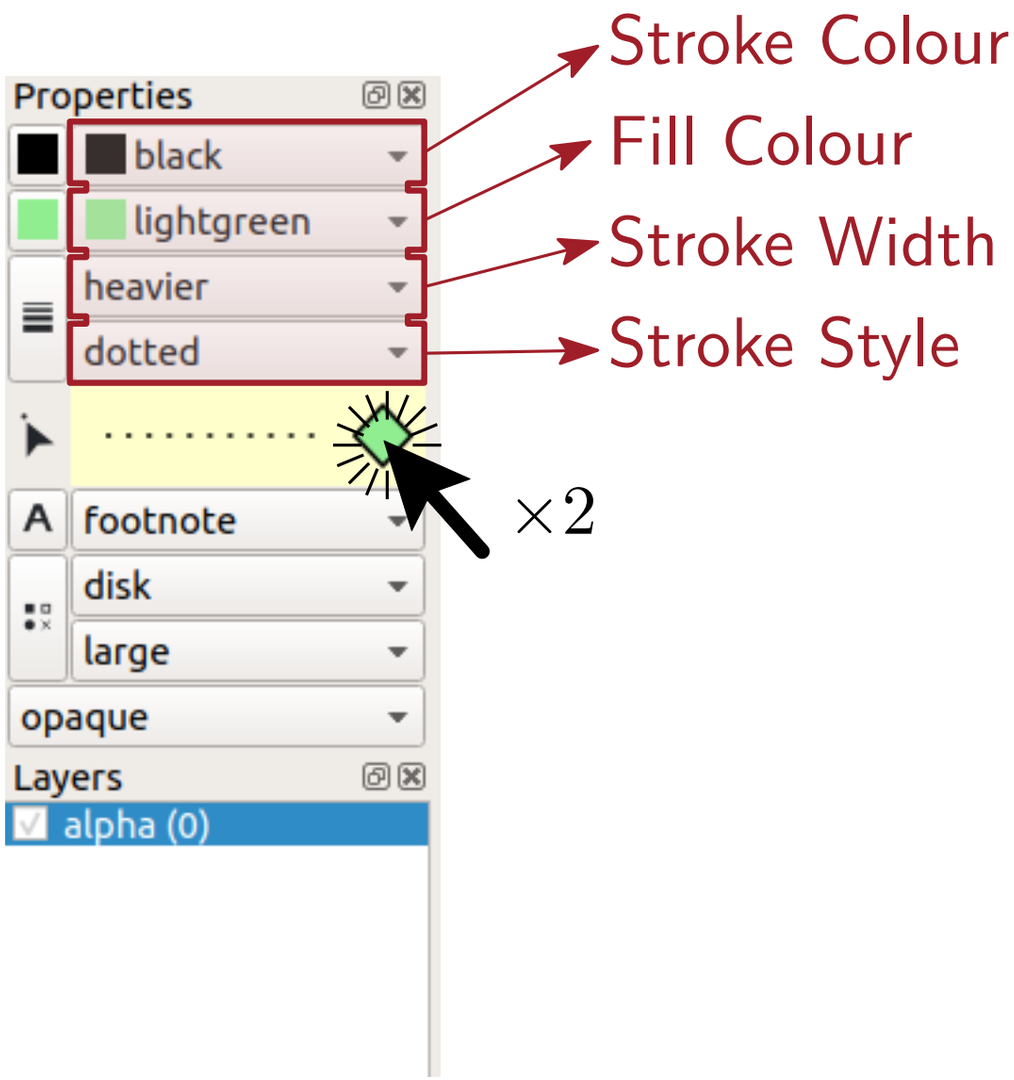

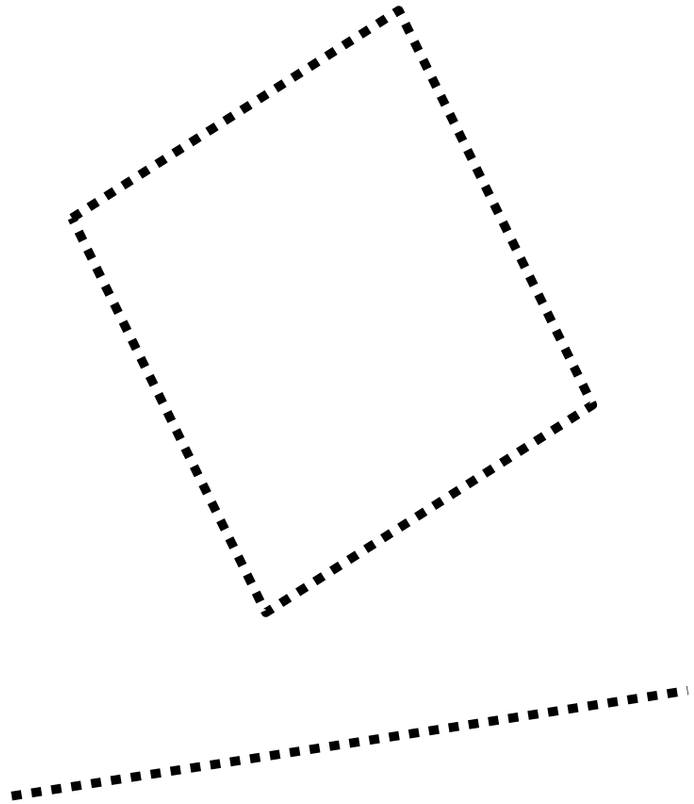

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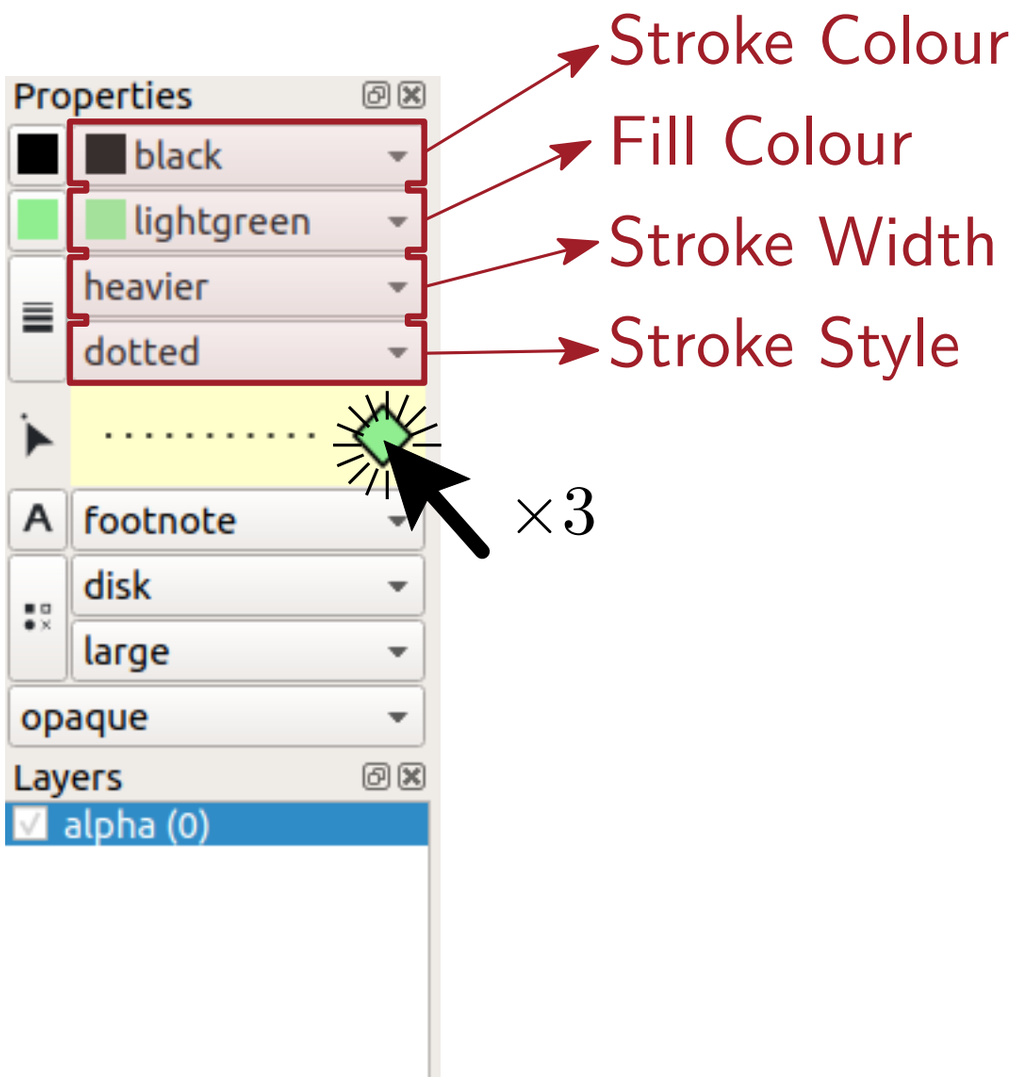

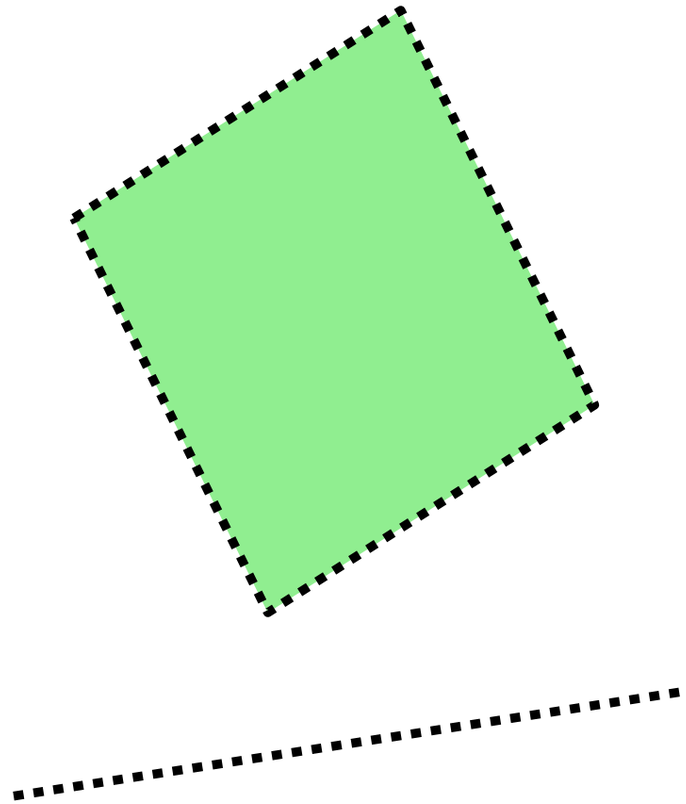

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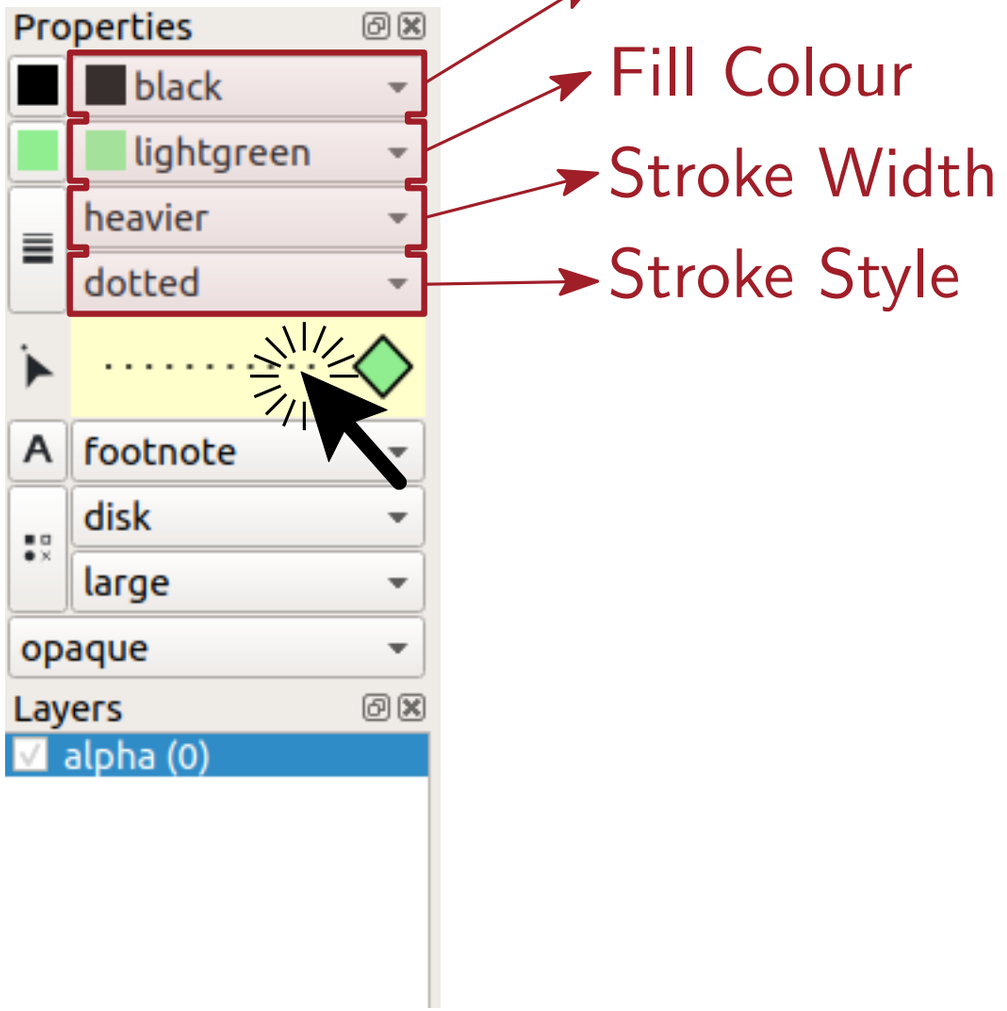

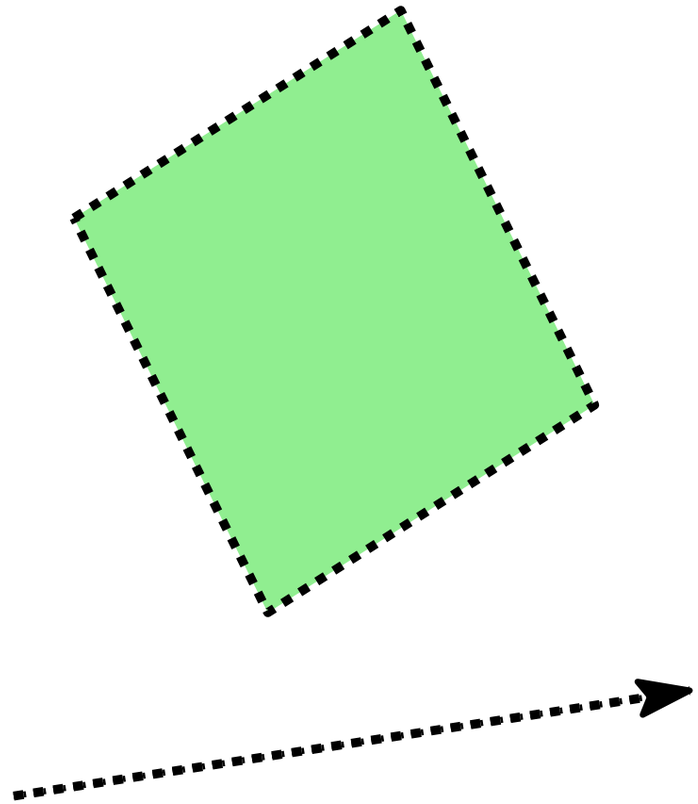

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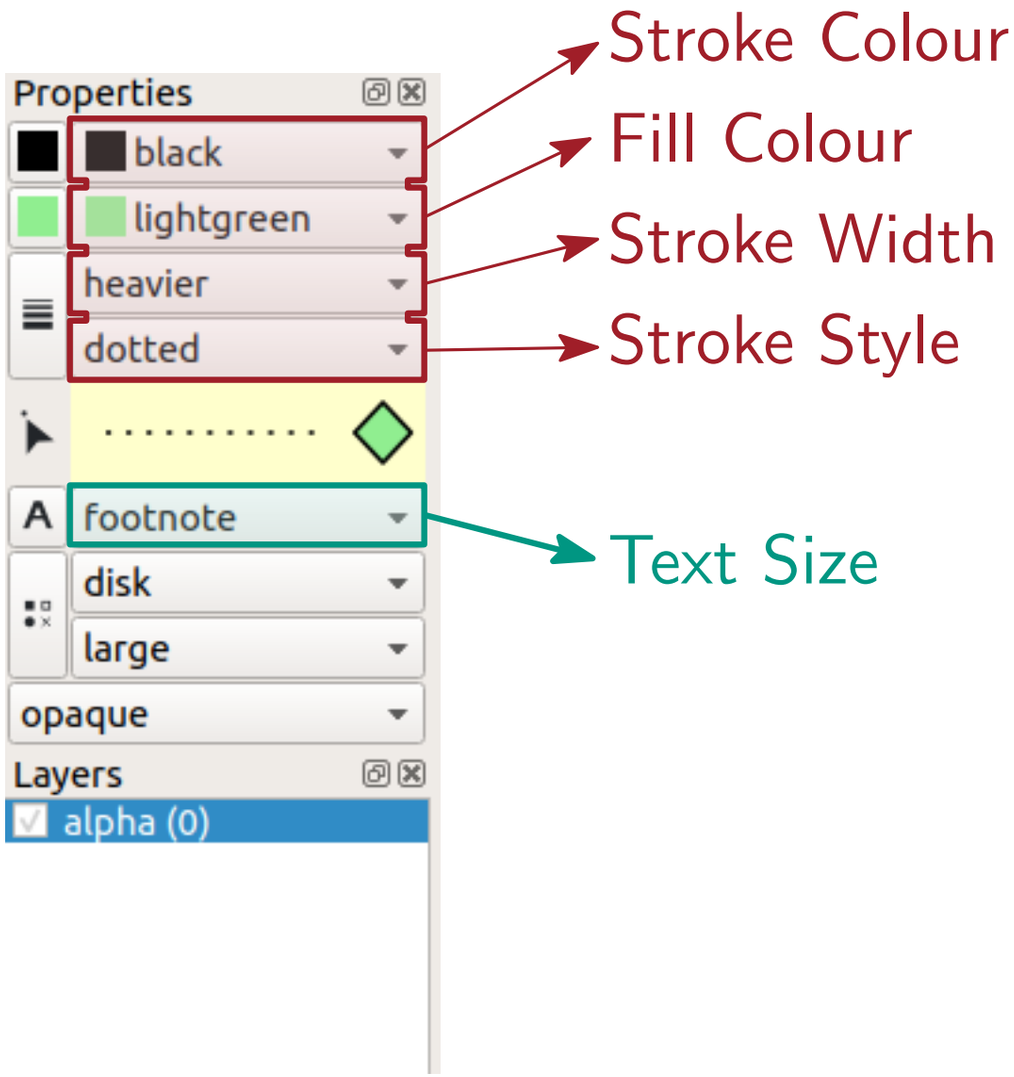

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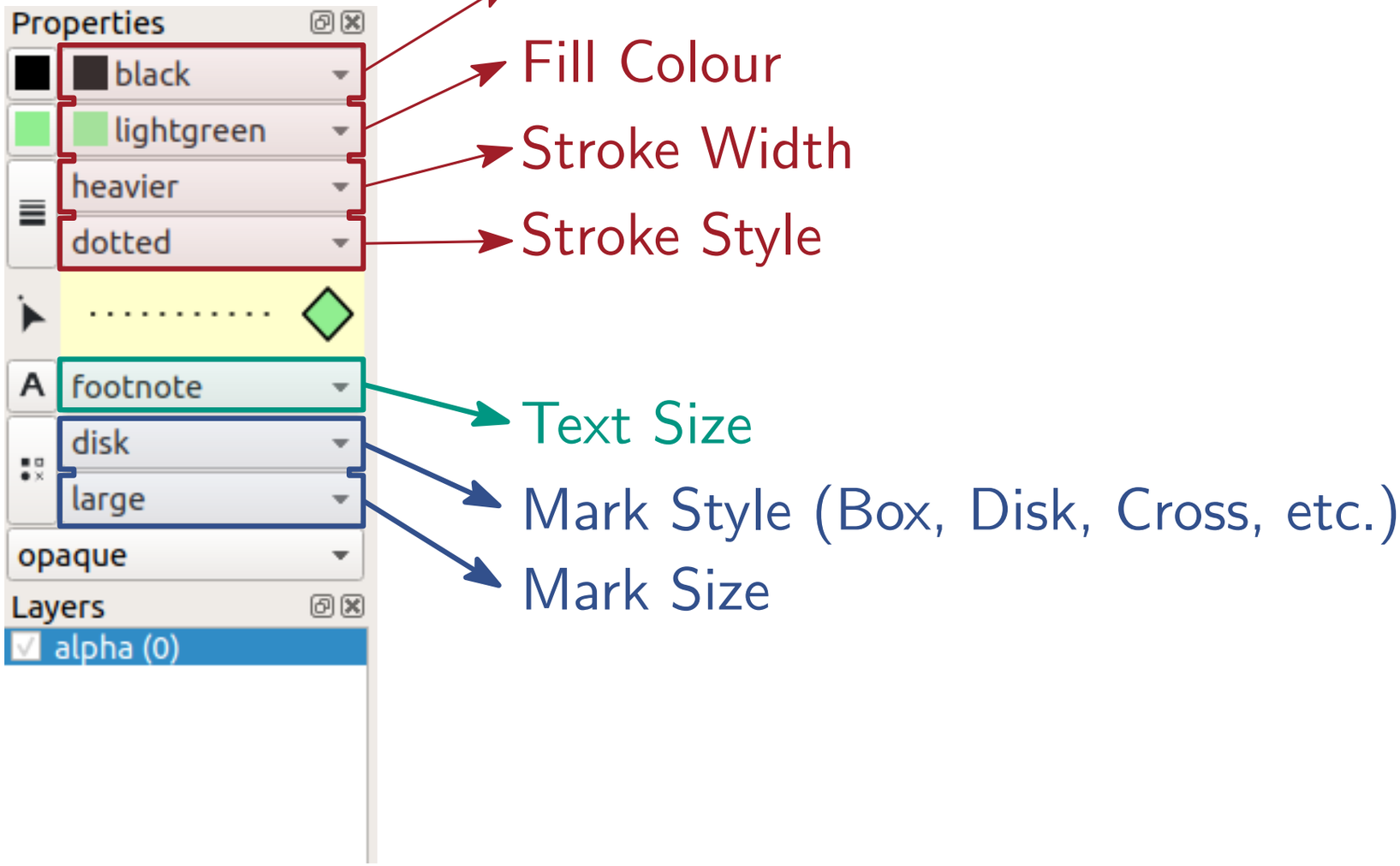

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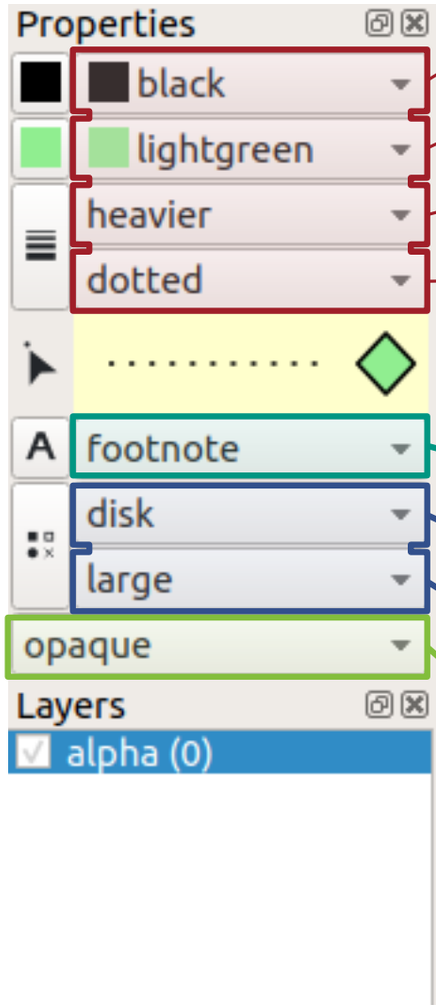


Stroke Colour

Fill Colour

Stroke Width

Stroke Style

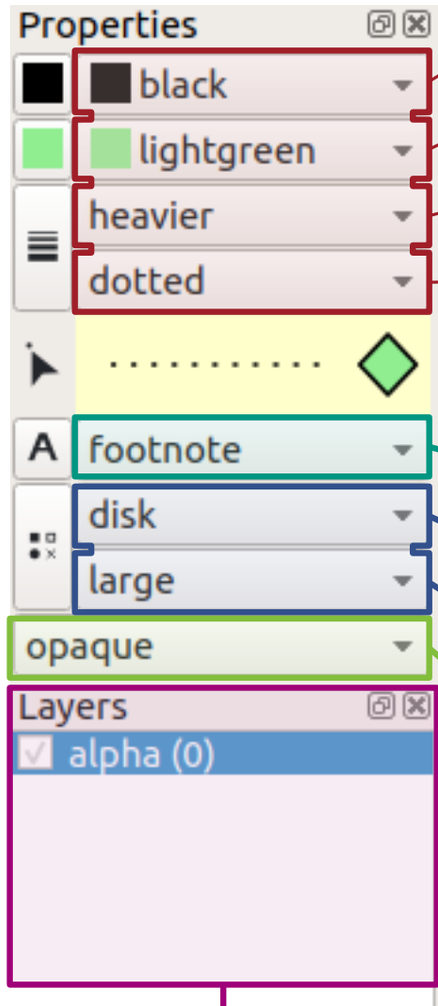
Text Size

Mark Style (Box, Disk, Cross, etc.)

Mark Size

Opacity
(Stroke Opacity != Opacity)

The Properties [EXTENDED VERSION]



Stroke Colour

Fill Colour

Stroke Width

Stroke Style

Text Size

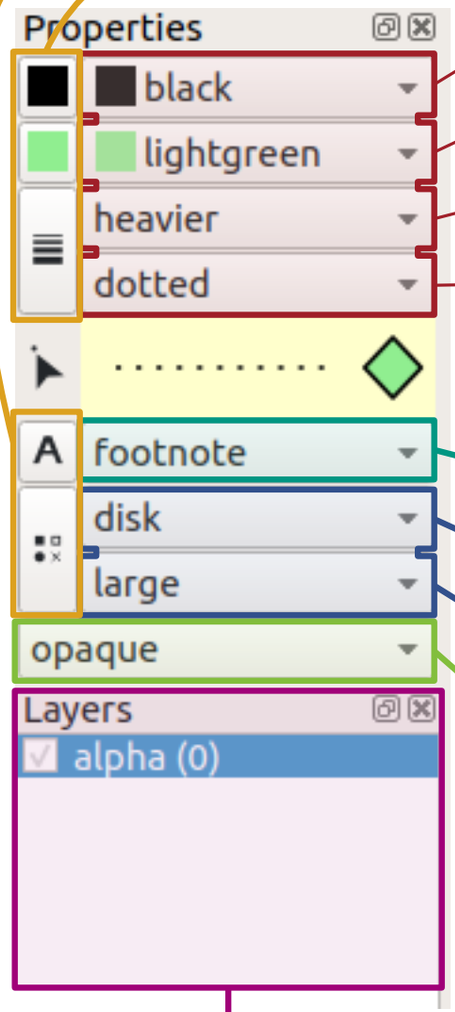
Mark Style (Box, Disk, Cross, etc.)

Mark Size

Opacity
(Stroke Opacity != Opacity)

Layers and Views (later)

The Properties [EXTENDED VERSION]



Stroke Colour

Fill Colour

Stroke Width

Stroke Style

Exact input is possible
(colour picker, enter size in points)

Text Size

Mark Style (Box, Disk, Cross, etc.)

Mark Size

Opacity
(Stroke Opacity != Opacity)

Layers and Views (later)

Shortcuts

Manipulation

[S]	Select
[E]	Scale
[Shift+E]	Scale (keep aspect ratio)
[R]	Rotate
[CTRL+R]	Exact rotate
[T]	Translate
[CTRL+E]	Edit mode/Change text
[CTRL + B]	Push object back
[CTRL + F]	Pull object on top

Objects

[M]	Marks
[P]	Polyline
[Shift+P]	Polygon
[G]	Minipage text
[F10]	Width-spanning t

Extras

[SHIFT+V]	Center vertically (on horizontal line)
[SHIFT+H]	Center horizontally (on vertical line)
[SHIFT+ALT+V]	Distribute vertically (No horizontal version)
[ALT+NP 2/4/6/8]	Translate by small steps
[CTRL+NP 2/4/6/8]	Translate by medium steps
[ALT+CTRL+NP 2/4/6/8]	Translate by big steps
[CTRL+G]	Group objects