Ti*k*Z reference

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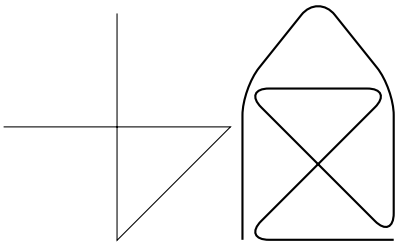
The Ti*k*Z commands can be inside the environment \begin{tikzpicture} . . . \end{tikzpicture} or simply use \tikz clause. We run pdflatex or latex followed by dvips to execute the Ti*k*Z commends.

1 Preliminary

1.1 Straight Path Construction

```
Useage:
  \draw[options] (x1,y1) -- (x2,y2) -- (x3,y3);

Example:
  \begin{tikzpicture}
    \draw (-1.5,0) -- (1.5,0) -- (0,-1.5) -- (0,1.5);
    \draw[thick, rounded corners=10pt] (0,0) -- (0,2) -- (1,3.25) --
    (2,2) -- (2,0) -- (0,2) -- (2,2) -- (0,0) -- (2,0);
  \end{tikzpicture}
```

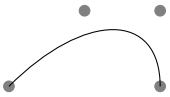


1.2 Circle Path Construction

```
Usage:
  \draw[options] (x,y) circle (raidus);
  \draw[options] (x,y) ellipse (x.raidus anda y.radius);

Example:
  \begin{tikzpicture}
    \draw (0,0) circle (2pt);
    \draw[red] (1,0) circle (3pt);
    \draw[fill=red] (2,0) circle (4pt);
    \draw[red,fill=red] (3,0) ellipse (10pt and 5pt);
    \filldraw[blue,rotate=30] (3.5,-2) ellipse (10pt and 5pt); % another way
  \end{tikzpicture}
```

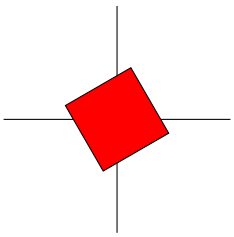
1.3 Curved Path Construction

```
Usage:
  \draw[options] (x1,y1) .. controls (x2,y2) and (x3,y3) .. (x4,y4);

Example:
  \begin{tikzpicture}
    \filldraw[gray] (0,0) circle (2pt) (1,1) circle (2pt)
                    (2,1) circle (2pt) (2,0) circle (2pt);
    \draw (0,0) .. controls (1,1) and (2,1) .. (2,0);
  \end{tikzpicture}
```



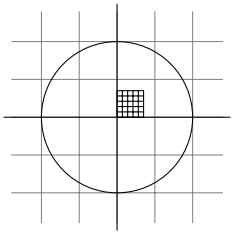
1.4 Rectangle Path Construction

```
Usage:
  \draw[options] (x1,y1) rectangle (x2,y2);

Example:
  \begin{tikzpicture}
    \draw (-1.5,0) -- (1.5,0);
    \draw (0,-1.5) -- (0,1.5);
    \draw[rotate=30, fill=red] (-0.5,-0.5) rectangle (-1,-1);
  \end{tikzpicture}
```



1.5 Grid Path Construction

```
Usage:
  \draw[options] (x1,y1) grid (x2,y2);

Example:
  \begin{tikzpicture}
    \draw[step=.5cm, gray, very thin] (-1.4,-1.4) grid (1.4,1.4);
    \draw (-1.5,0) -- (1.5,0);
    \draw (0,-1.5) -- (0,1.5);
    \draw (0,0) circle (1cm);
    \draw[step=2pt] (0,0) grid (10pt,10pt);
  \end{tikzpicture}
```



1.6 Drawing Options

There are some drawing options that one can use to control the color, thickness, and line type.

- color: blue, black, brown, cyan, gray, green, lightgray, lime, magenta, orange, pink, purple, red, yellow, teal, violet, white.
  Note: Colors can also be mixed. The color `[blue!40!white]` means 40% blue and 60% white mixed together.

- thickness: ultra thin, very thin, thin, semithick, thick, very thick, ultra thick.
  Note: `[help lines]=[gray,very thin]`. Line thickness can be also specified by `[line width]` option, say `[line width=0.5cm]`.

- line type: loosely dashed, dashed, densely dashed, loosely dotted, dotted, densely dotted.

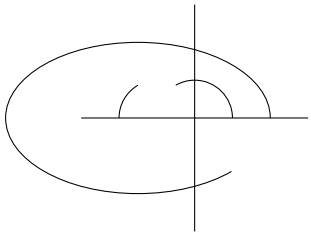
- arrow: `<-` ←, `<<-` ↞, `<-|` ↤, `<<-|` ↞|, `->` →, `->>` ↠, `|->` ↦, `|->>` ↦↠, `<->` ↔, `<<->>` ↞↠.
  Note: You can also add `>=stealth` in the options, which changes the arrow to 'stealth-like' style.

```
Usage:
  \draw[color, thickness, line type, arrow] (x1,y1) -- (x2,y2);

Example:
  \begin{tikzpicture}
    \draw[red, very thin, densely dashed, <-] (0,0) -- (0.9,0);
    \draw[green, ultra thick, loosely dotted, |->] (1.1,0) -- (1.9,0);
    \draw[blue, semithick, <->, >=stealth] (2.1,0) -- (2.9,0);
    \draw[purple, line width=0.3cm] (3.1,0) -- (3.9,0);
  \end{tikzpicture}
```

1.7 Arc Path Construction

```
Usage:
  \draw (x,y) arc (angle1:angle2:radius);
  \draw[start angle=angle1, end angle=angle2, radius=radius] (x,y) arc;
  \draw (x,y) arc (angle1:angle2:x.radius and y.radius);

Example:
  \begin{tikzpicture}
```

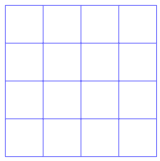
```
  \draw (-1.5,0) -- (1.5,0);
  \draw (0,-1.5) -- (0,1.5);
  \draw (0.5,0) arc (0:120:0.5cm);
  \draw (1,0) arc (0:315:1.75cm and 1cm);
  \draw[start angle=180, end angle=120, radius=0.5cm] (-1,0) arc;
  % The above is not a recommand way.
\end{tikzpicture}
```



1.8 Adding a Touch Style

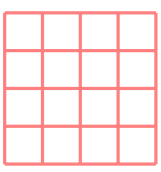
Styles are predefined sets of options that can be used to organize how a graphic is drawn. To define a style globally, we can use the \tikzset command at the beginning of the document.

```
Usage:
  \tikzset{style_name./style={options}}

Example:
  \tikzset{blue_thin_lines/.style={color=blue!50,very thin}}
  \begin{tikzpicture}
    \draw[blue_thin_lines] (0,0) grid (5,5);
  \end{tikzpicture}
```



To define a style locally, we use a pair of square bracket "[ ]" to define styles at the beginning of a picture.

```
Usage:
  [style_name/.style={options}]

Example:
  \begin{tikzpicture}
    [red_thick_lines/.style={color=red!50,very thick}];
    \draw[step=0.5cm, red_thick_lines] (0,0) grid (2,2);
  \end{tikzpicture}
```



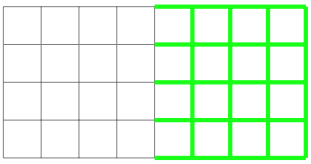
One can also define styles hierarchically.

Usage:

```
\tikzset{style_name1/.style={style_name2, options}}
```

Example:

```
\tikzset{green_help_lines/.style={help lines, color=green!90}}
\begin{tikzpicture}
  \draw[step=0.5cm, green_help_lines] (0,0) grid (5,5);
\end{tikzpicture}
```



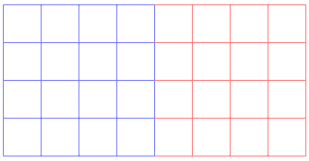
Styles can also be used with a parameter.

Usage:

```
[style_name/.style={options}, style_name/.default={options}]
```

Example:

```
\begin{tikzpicture}
  [para_color/.style={help lines,color=#1!50}, para_color/.default=blue]
  \draw[step=0.5cm, para_color] (0,0) grid (2,2);
  \draw[step=0.5cm, para_color=red] (2,0) grid (4,2);
\end{tikzpicture}
```



1.9 Clipping a Path

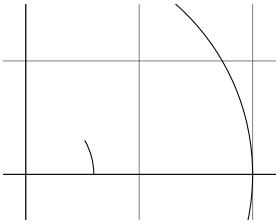
The \clip command clip all subsequent drawing.

Usage:

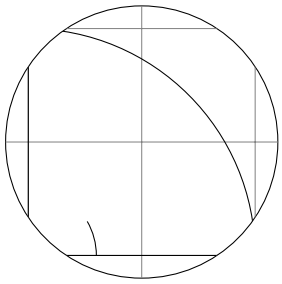
```
\clip[options] (x1,y1) rectangle (x2,y2);
```

Example:

```
\begin{tikzpicture}[scale=3]
  \clip (-0.1,-0.2) rectangle (1.1,0.75);
  \draw[step=.5cm, help lines] (-1.4,-1.4) grid (1.4,1.4);
  \draw (-1.5,0) -- (1.5,0);
  \draw (0,-1.5) -- (0,1.5);
  \draw (0,0) circle (1cm);
  \draw (3mm,0mm) arc (0:30:3mm);
\end{tikzpicture}
```

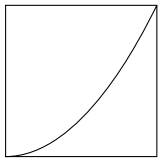


```
Usage:
  \clip (x1,y1) circle (radius);

Example:
  \begin{tikzpicture}[scale=3]
    \clip[draw] (0.5,0.5) circle (.6cm);
    \draw[step=.5cm, help lines] (-1.4,-1.4) grid (1.4,1.4);
    \draw (-1.5,0) -- (1.5,0);
    \draw (0,-1.5) -- (0,1.5);
    \draw (0,0) circle (1cm);
    \draw (3mm,0mm) arc (0:30:3mm);
  \end{tikzpicture}
```



1.10 Parabola Path Construction

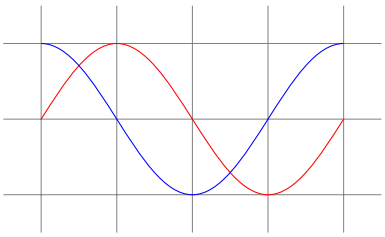
```
Usage:
  \draw[options] (x1,y1) parabola (x2,y2);

Example:
  \begin{tikzpicture}[scale=3]
    \draw (0,0) rectangle (1,1) (0,0) parabola (1,1);
  \end{tikzpicture}
```



```
Usage:
  \draw[options] (x1,y1) parabola bend (x2,y2) (x3,y3);

Example:
  \begin{tikzpicture}
    \draw[x=0.2cm,y=0.2cm] (0,0) parabola bend (4,10) (6,6);
  \end{tikzpicture}
```

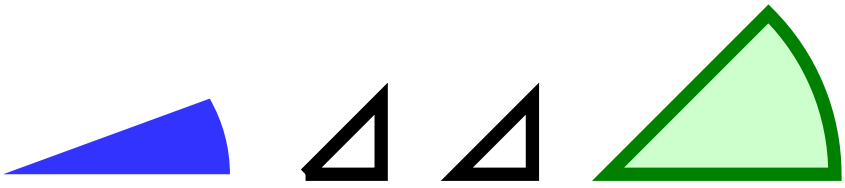
1.11 Sine and Cosine Path Construction

```
Usage:
  \draw[options] (x1,y1) sin (x2,y2);
  \draw[options] (x1,y1) cos (x2,y2);

Example:
  \begin{tikzpicture}
    \draw[help lines] (-0.5,-1.5) grid (4.5,1.5);
    \draw[red] (0,0) sin (1,1) cos (2,0) sin (3,-1) cos (4,0);
    \draw[blue] (0,1) cos (1,0) sin (2,-1) cos (3,0) sin (4,1);
  \end{tikzpicture}
```



1.12 Filling and Drawing

```
Usage:
  \fill[options] (x1,y1) -- (x2,y2) arc (angle1:angle2:radius) -- (x3,y3);
  \fill[options] (x1,y1) -- (x2,y2) arc (angle1:angle2:radius) -- cycle; % better
  \filldraw[options] (x1,y1) -- (x2,y2) arc (angle1:angle2:radius) -- cycle;

Example:
  \begin{tikzpicture}[line width=5pt]
    \fill[blue!80] (0,0) -- (3,0) arc (0:30:2) -- (0,0);
    \draw (4,0) -- (5,0) -- (5,1) -- (4,0);
    \draw (6,0) -- (7,0) -- (7,1) -- cycle;
    \filldraw[fill=green!20!white, draw=green!50!black]
      (8,0) -- (11,0) arc (0:45:3) -- cycle;
  \end{tikzpicture}
```



1.13 Shading

1.14 Nodes