

L^AT_EX and Friends


TikZ

M. R. C. van Dongen

ucc

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Introducing tikz

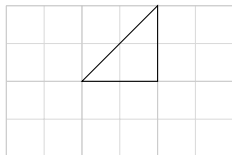
- Drawing with `tikz` is done in `tikzpicture` environment.
- The `tikzpicture` is drawn as smallest possible box.
- All *implicit* units inside a `tikzpicture` are in centimetres.
- The following draws a 0.4×0.2 crossed rectangle: .

L^AT_EX Usage

The following draws

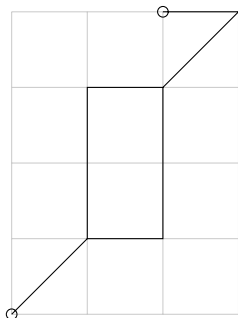
a 0.4×0.2 crossed rectangle:

```
\begin{tikzpicture}
\draw (0.0,0.0) rectangle (0.4,0.2);
\draw (0.0,0.0) -- (0.4,0.2);
\draw (0.0,0.3) -- (0.4,0.0);
\end{tikzpicture}\,.
```



L^AT_EX Input

```
\draw[line width=0.1pt,gray!30,step=5mm]
  (0,0) grid (3,2);
\draw[help lines]
  (0,0) grid (3,2);
\draw (1,1) --
  (2,2) -- (2,1) -- cycle;
```



L^AT_EX Input


```
\draw[help lines] (0,0) grid (3,4);  
\draw (0,0) circle (2pt)  
  -- (1,1) rectangle (2,3)  
  -- (3,4)  
  -- (2,4) circle (2pt);
```

L^AT_EX Usage

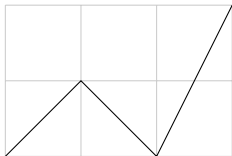
The following, which draws a crossed rectangle

```
(\begin{tikzpicture}
  \draw (0.0,0.0) coordinate(lower left)
         -- (0.4,0.2) coordinate(upper right);
  \draw (0.0,0.2) -- (0.4,0.0);
  \draw (lower left) rectangle (upper right);
\end{tikzpicture}), demonstrates the mechanism.
```

L^AT_EX Output

The following, which draws a crossed rectangle () , demonstrates the mechanism.

Line-To Operation



L^AT_EX Input

```
\draw[help lines] (0,0) grid (3,2);  
\draw (0,0) -- (1,1) --  
      (2,0) -- (3,2);
```

Presenting Diagrams

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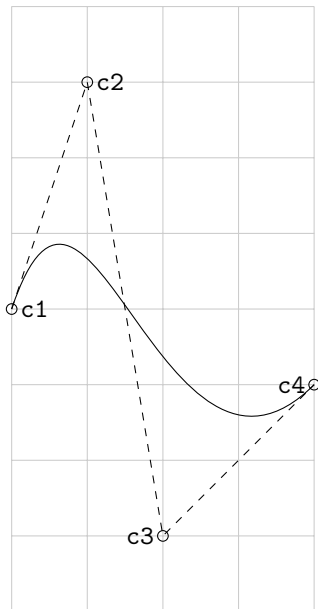
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Curve-to-Operation: Output



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Curve-to Operation: Input

L^AT_EX Input

```

\draw[help lines] (-2,-4) grid (+2,+4);
  \path (-2,+0) coordinate(c1)
        (-1,+3) coordinate(c2)
        (+0,-3) coordinate(c3)
        (+2,-1) coordinate(c4);
\draw[dashed] (c1) -- (c2) -- (c3) -- (c4);
\draw (c1) circle (2pt)
      (c2) circle (2pt)
      (c3) circle (2pt)
      (c4) circle (2pt)
      (c1) .. controls (c2)
              and (c3) .. (c4)
      (c1) node[anchor=west] {\texttt{c1}}
      (c2) node[anchor=west] {\texttt{c2}}
      (c3) node[anchor=east] {\texttt{c3}}
      (c4) node[anchor=east] {\texttt{c4}};

```

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Cycle Operation



L^AT_EX Input

```
\draw (0,0) -- (1,1)  
      (2,0) -- (3,0) --  
      (3,1) -- cycle;
```

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Horizontal and Vertical Connections

**L^AT_EX** Input

```
\tikz \draw (0.0,0.0) -| (2.0,0.5)  
            (1.0,1.0) -| (3.0,0.0);
```

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Horizontal and Vertical Connections (Continued)

**L^AT_EX** Input

```
\tikz \draw (0.0,0.0) |- (2.0,1.0)  
          (1.0,0.5) |- (3.0,0.0);
```

Rectangle Operation



L^AT_EX Input

```
\begin{tikzpicture}
\draw (0,0) rectangle (1,1)
       rectangle (3,2);
\end{tikzpicture}
```

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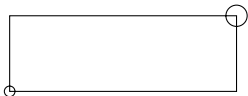
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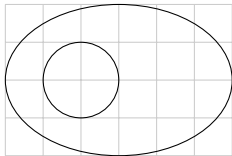
Circle Operation



L^AT_EX Input

```
\tikz \draw (0,0) circle (2pt)
         rectangle (3,1)
         circle (4pt);
```

Ellipse Operation



L^AT_EX Input

```
\begin{tikzpicture}[scale=0.5]
\draw[help lines] (0,0) grid (6,4);
\draw (2,2) ellipse (1cm and 1cm)
      (3,2) ellipse (3cm and 2cm);
\end{tikzpicture}
```

Arc Operation

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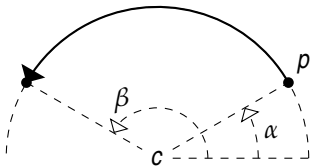
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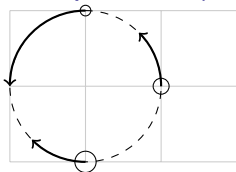
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```
\path ... arc ( $\alpha$ : $\beta$ : $r$ ) ...;
```



Arc Operation (Continued)

L^AT_EX Input

```

\begin{tikzpicture}
\draw[help lines] (0,0) grid (3,2);
\draw[dashed] (1,1) circle (1cm);
\draw (1,2) coordinate(a) circle (2pt)
      (2,1) coordinate(b) circle (3pt)
      (1,0) coordinate(c) circle (4pt);
\draw[->,thick] (a) arc (90:180:1cm);
\draw[->,thick] (b) arc (0:45:1cm);
\draw[->,thick] (c) arc (270:225:1cm);
\end{tikzpicture}

```

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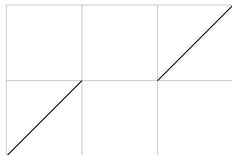
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Move-To Operation



L^AT_EX Input

```
\begin{tikzpicture}  
\draw[help lines] (0,0) grid (3,2);  
\draw (0,0) -- (1,1)  
       (2,1) -- (3,2);  
\end{tikzpicture}
```

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Filling a Path

L^AT_EX Output

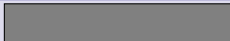


L^AT_EX Input

```
\fill[gray] (0,0) rectangle (3,0.5);
```

Filling and Drawing a Path

L^AT_EX Output



L^AT_EX Input

```
\filldraw[fill=gray,draw=black]  
  (0,0) rectangle (3,0.5);
```

Shading a Path

L^AT_EX Output



L^AT_EX Input

```
\shade[left color=black,right color=gray]  
  (0,0) rectangle (3,0.5);
```

Shading and Drawing a Path

L^AT_EX Output



L^AT_EX Input

```
\shadedraw[left color=black,  
            right color=white,  
            draw=gray]  
(0,0) rectangle (3,0.5);
```

Some Existing Named Colours

 black	 darkgray	 lime	 pink	 violet
 blue	 gray	 magenta	 purple	 white
 brown	 green	 olive	 red	 yellow
 cyan	 lightgray	 orange	 teal	

Defining New Colours

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```
\definecolor{<name>}{rgb}{<red>,<green>,<blue>}
\definecolor{<name>}{gray}{<ratio>}
\colorlet{<name>}{<colour>!<percentage>}
\colorlet{<name>}{<colour12
```

L^AT_EX Input

```
\begin{tikzpicture}[color=red]
\draw                (0,3) -- (2,3);
\draw[color=green]   (0,2) -- (2,2);
\draw[color=cyan!50!red] (0,1) -- (2,1);
\end{tikzpicture}
```


Variations

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L^AT_EX Input

```
\begin{tikzpicture}[gray]
\draw[orange!80!teal] (0,0) -- (2,0);
\end{tikzpicture}
```

Drawing the Path

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```
\draw[draw=gray] (0,1) -- (2,1);
```

Line Style

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Acronyms & Abbreviations

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L^AT_EX Input

```
\draw[line width=8pt]  
  (0,0) -- (2,4pt);
```

Dash Patterns

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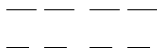
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L^AT_EX Input

```
\draw[dash pattern=on 4mm off 1mm on 4mm off 2mm]
(0,0.5) -- (2,0.5);
\draw[dash pattern=on 3mm off 2mm on 3mm off 3mm]
(0,0.0) -- (2,0.0);
```

Dash Pahases

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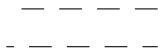
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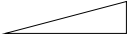

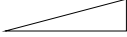

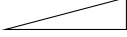
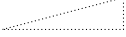
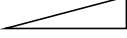
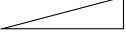
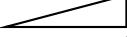
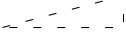
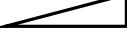
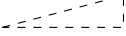

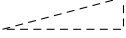
L^AT_EX Input

```
\begin{tikzpicture}[dash pattern=on 3mm off 2mm]
\draw[dash phase=3mm] (0,0.5) -- (2,0.5);
\draw[dash phase=2mm] (0,0.0) -- (2,0.0);
\end{tikzpicture}
```

Predefined Line Styles

Line Styles

Dash Patterns

Name	Width	Example	Name	Example
<code>ultra thin</code>	0.1 pt		<code>loosely dotted</code>	
<code>very thin</code>	0.2 pt		<code>dotted</code>	
<code>thin</code>	0.4 pt		<code>densely dotted</code>	
<code>semithick</code>	0.6 pt		<code>solid</code>	
<code>thick</code>	0.8 pt		<code>loosely dashed</code>	
<code>very thick</code>	1.2 pt		<code>dashed</code>	
<code>ultra thick</code>	1.6 pt		<code>densely dashed</code>	

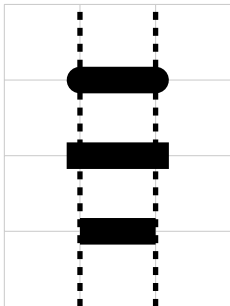
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Line Cap



L^AT_EX Input

```

\begin{tikzpicture}[line width=10pt]
\draw[help lines] (0,0) grid (3,4);
\draw[line width=2pt,dashed]
  (1,0) -- (1,4) (2,0) -- (2,4);
\draw[line cap=round] (1,3) -- (2,3);
\draw[line cap=rect] (1,2) -- (2,2);
\draw[line cap=butt] (1,1) -- (2,1);
\end{tikzpicture}

```



L^AT_EX Input

```
\begin{tikzpicture}[line width=8pt]
\draw[line join=round]
(0.0,.8)--(0.3,.0)--(0.6,.8);
\draw[line join=miter]
(0.9,.0)--(1.2,.8)--(1.5,.0);
\draw[line join=bevel]
(1.8,.8)--(2.1,.0)--(2.4,.8);
\end{tikzpicture}
```

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Arrows



L^AT_EX Input

```
\draw[->] (0,1.0) -- (2,1.0);  
\draw[<-] (0,0.5) -- (2,0.5);  
\draw[<->] (0,0.0) -- (2,0.0);
```

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Using Different Arrow Heads

L^AT_EX Input

```

\draw[>=o,<->] (0,1.0) -- (2,1.0);
\draw[>=*,<-] (0,0.5) -- (2,0.5);
\draw[>=latex,->] (0,0.0) -- (2,0.0);

```

Predefined Arrow Heads

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












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Predefined					
Style	Arrow	Style	Arrow	Style	Arrow
<code>stealth</code>		<code>to</code>		<code>latex</code>	
<code>space</code>					
Provided by <code>arrows</code>					
<code>open triangle 90</code>		<code>triangle 90</code>		<code>angle 90</code>	
<code>open triangle 60</code>		<code>triangle 60</code>		<code>angle 60</code>	
<code>open triangle 45</code>		<code>triangle 45</code>		<code>angle 45</code>	
<code>open diamond</code>		<code>diamond</code>		<code>o</code>	
<code>open square</code>		<code>square</code>		<code>*</code>	

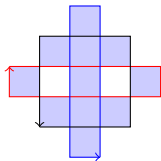
Filling a Path



L^AT_EX Input

```
\begin{tikzpicture}[scale=0.4,fill=gray]
\path[fill]
  (0,0) rectangle (1,1);
\path[fill=black!30]
  (2,0) -- (3,0) -- (3,1) -- cycle;
\path[fill,color=gray]
  (4,0) -- (5,0) -- (5,1);
\end{tikzpicture}
```

Filling Options: The Nonzero Rule



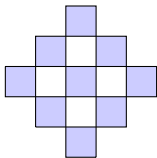
L^AT_EX Input

```

\begin{tikzpicture}[fill=blue!20,scale=0.4]
\fill (0,2) -- (0,3) -- (5,3) -- (5,2)
      (2,0) -- (3,0) -- (3,5) -- (2,5)
      (1,1) -- (4,1) -- (4,4) -- (1,4);
\draw[red,->]
      (0,3) -- (5,3) -- (5,2) -- (0,2) -- (0,3);
\draw[blue,->]
      (3,0) -- (3,5) -- (2,5) -- (2,0) -- (3,0);
\draw[->]
      (1,1) -- (4,1) -- (4,4) -- (1,4) -- (1,1);
\end{tikzpicture}

```

Filling Options: The Even Odd Rule



L^AT_EX Input

```

\begin{tikzpicture}[fill=blue!20,scale=0.4]
\fill[even odd rule]
  (0,2) -- (0,3) -- (5,3) -- (5,2)
  (2,0) -- (3,0) -- (3,5) -- (2,5)
  (1,1) -- (4,1) -- (4,4) -- (1,4);
\draw (0,3) -- (5,3) -- (5,2) -- (0,2) -- (0,3);
\draw (3,0) -- (3,5) -- (2,5) -- (2,0) -- (3,0);
\draw (1,1) -- (4,1) -- (4,4) -- (1,4) -- (1,1);
\end{tikzpicture}

```

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```
\path ... node(<label>) [<options>] {<content>} ... ;  
\draw ... node(<label>) [<options>] {<content>} ... ;
```

Example

north west north north east
 west hello east
 south west south south east

L^AT_EX Input

```
\begin{tikzpicture}
\draw (0,0) node(hello)[scale=1.25] {hello};
\draw (hello.north) circle (2pt)
      node[anchor=south] {north};
\draw (hello.north east) circle (2pt)
      node[anchor=south west] {north east};
... % remaining commands omitted.
```


Node Shapes

- `coordinate` For coordinates.
- `rectangle` For rectangles (default).
- `circle` For circles.
- `ellipse` For ellipses.

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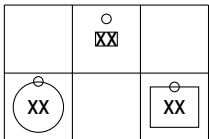
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Example



L^AT_EX Input

```

\draw (0,0) grid (3,2);
\draw (1.5,2.5) node(a) [draw,inner sep=0pt,
                        outer sep=5pt] {xx};
\draw (3.5,1.5) node(b) [draw,inner sep=5pt,
                        outer sep=0pt] {xx};
\draw (1.5,1.5) node(c) [draw,shape=circle] {xx};
\draw (a.north) circle (2pt);
\draw (b.north) circle (2pt);
\draw (c.north) circle (2pt);

```

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Node Options

```
draw
scale=<factor>
anchor=<anchor>
shift=<shift>
rotate=<angle>
pos=<real>
pos=sloped
midway
```

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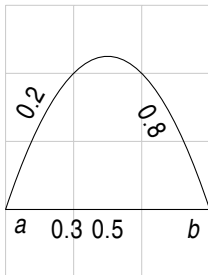
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Example

L^AT_EX Input

```

\draw[help lines] (0,0) grid (3,4);
\draw (0,1) coordinate(a)
      node[anchor=north west] {$a$}
  -- (3,1) coordinate(b)
      node[anchor=north east] {$b$}
      node[pos=0.3,anchor=north] {$0.3$}
      node[pos=0.5,anchor=north] {$0.5$}
  (a) .. controls (1,4) and (2,4) .. (b)
      node[pos=0.2,sloped,anchor=south] $0.2$
      node[pos=0.8,sloped,anchor=north] $0.8$;

```

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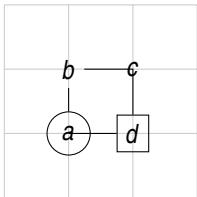
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Drawing to and from Nodes



L^AT_EX Input

```

\draw[help lines] (0,0) grid (3,3);
\path (1,1) node(a) [draw,shape=circle]   {$a$};
\path (1,2) node(b) [shape=rectangle]     {$b$};
\path (2,2) node(c) [shape=circle]       {$c$};
\path (2,1) node(d) [draw,shape=rectangle] {$d$};
\draw (a) -- (b) -- (c.center) -- (d) -- (a.center);

```

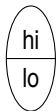
Special Node Shapes: circle split



L^AT_EX Input

```
\draw (0,0)
  node(double)[circle split,draw,double]
    {$q$ \nodepart{lower} $00$}
  (double.lower) circle (1pt)
  (double.text) circle (1pt);
```

Special Node Shapes: ellipse split



L^AT_EX Input

```
\draw (0,0) node[ellipse split,draw]
{hi \nodepart{lower} lo};
```

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Special Node Shapes: rectangle Split

Row 1
Row 2
Row 3
Row four

L^AT_EX Input

```
\node[rectangle split, rectangle split parts=4,
  every text node part/.style={align=center},
  every two node part/.style={align=left},
  every three node part/.style={align=right},
  draw, text width=2.5cm]
{ Row 1
  \nodepart{two} Row 2
  \nodepart{three} Row 3
  \nodepart{four} Row four };
```

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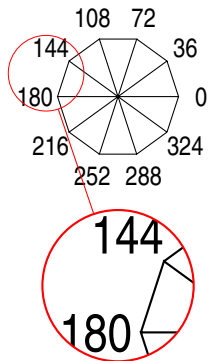
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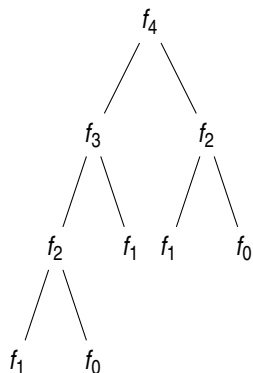
L^AT_EX Input

```
\begin{tikzpicture}
  [spy using outlines={circle,
                      magnification=2,
                      size=2cm,
                      connect spies}]

\draw (-36:0.8)
  \foreach \angle in {0,36,...,359} {
    -- (\angle:0.8)
    (\angle:1.1) node {$\angle$}
    (0,0) -- (\angle:0.8)
  };

\spy[red] on (162:1.0) in node[right] at (0,-2.5);
\end{tikzpicture}
```

Drawing Trees (Output)



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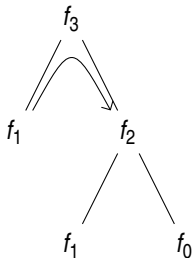
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L^AT_EX Input

```
\begin{tikzpicture}
  [level 2/.style={sibling distance=10mm}]
  \node {$f_4$}
    child {node {$f_3$}
      child {node {$f_2$}
        child {node {$f_1$}}
        child {node {$f_0$}}}
      child {node {$f_1$}}}
    child {node {$f_2$}
      child {node {$f_1$}}
      child {node {$f_0$}}};
\end{tikzpicture}
```

Node Labels in Trees



L^AT_EX Input

```

\node (top) {$f_3$}
  child {node {$f_1$}}
  child {node {$f_2$}
    child {node {$f_1$}}
    child {node {$f_0$}}};
\draw[-angle 90]
  (top-1.north east) .. controls (top.south)
    .. (top-2.north west);
  
```

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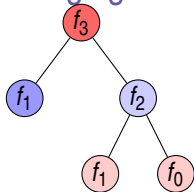
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Changing the Node Style

L^AT_EX Input

```

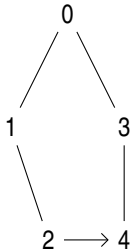
\begin{tikzpicture}
[level distance=10mm%
, every node/.style={fill=red!60,%
                    circle,%
                    draw=black,%
                    inner sep=1pt}%
, level 1/.style={sibling distance=15mm},%
, level 2/.style={sibling distance=10mm,%
                 nodes={fill=red!20}}]

\node (top) {$f_3$}
  child {node[fill=blue!40] {$f_1$}}
  child {node[fill=blue!20] {$f_2$}
    child {node {$f_1$}}
    child {node {$f_0$}}};
\end{tikzpicture}

```

Missing in Action

Automatic Node Placement is not Always Ideal



L^AT_EX Input

```

\begin{tikzpicture}
  [level 2/.style={sibling distance=10mm}]
  \node (top) {$0$}
    child {node {$1$}
      child[missing]
      child {node {$2$}}}
    child {node {$3$}
      child {node {$4$}}};
  \draw[-angle 90]
    (top-1-2.east) -- (top-2-1.west);
\end{tikzpicture}
  
```

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`explicit` \langle system name \rangle `cs:` \langle coordinate specification \rangle .

`implicit` $(0,1)$, $(label)$, $(0,1 | - label)$,

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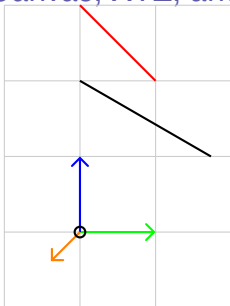
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Canvas, XYZ, and Polar

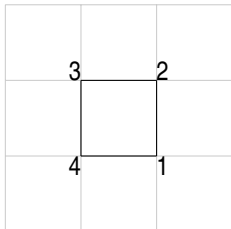
L^AT_EX Input

```

\begin{tikzpicture}[>=angle 90,thick]
\draw[help lines] (-1,-1) grid (2,3);
\draw[red] (canvas cs:x=1cm,y=2cm) -- (0,3);
\draw[green,->] (0,0) -- (xyz cs:x=1,y=0,z=0);
\draw[blue,->] (0,0) -- (0,1,0);
\draw[orange,->] (0,0) -- (0,0,1);
\draw (canvas polar cs:radius=2cm,angle=30)
      -- (90:2);
\path (0,0) coordinate (origin);
\draw (origin) node circle (2pt);
\end{tikzpicture}

```

Intersection Coordinate Systems



L^AT_EX Input

```

\draw[help lines] (0,0) grid +(3,3);
\path (1,1) coordinate (ll);
\path (2,2) coordinate (ur);
\draw (ll) -- (ll -| ur) node[anchor=north west] {1};
\draw (ll -| ur) -- (ur) node[anchor=south west] {2};
\draw (ur) -- (ur -| ll) node[anchor=south east] {3};
\draw (ur -| ll) -- (ll) node[anchor=north east] {4};

```

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Relative and Incremental Coordinates



L^AT_EX Input

```

\draw[help lines] (0,0) grid +(3,2);
\draw (0,0) -- (+1,0) --
      (1,1) -- (+0,1) -- cycle;
\draw (1,1) -- +(1,0) --
      +(1,1) -- +(0,1) -- cycle;
\draw (2,0) -- ++(1,0) --
      ++(0,1) -- ++(-1,0) -- cycle;

```

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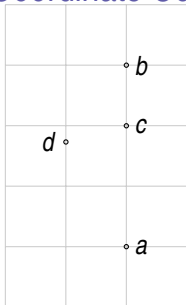
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Coordinate Computations: Partway Modifiers

L^AT_EX Input

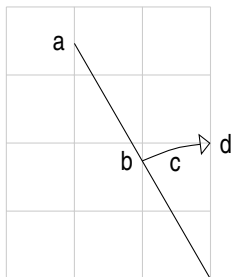
```

\draw[help lines] (0,0) grid +(3,5);
\draw (2.0,1.0)      circle (1pt)
                  coordinate(a)
                  node[anchor=west] {$a$}
(2.0,4.0)          circle (1pt)
                  coordinate(b)
                  node[anchor=west] {$b$}
($a)!0.666!(b)$   circle (1pt)
                  node[anchor=west] {$c$}
($a)!0.666!30:(b)$ circle (1pt)
                  node[anchor=west] {$d$};

```



Coordinate Computations: Distance Modifiers



L^AT_EX Input

```

\draw[help lines] (-3,0) grid +(3,4);
\draw (0,0) --
  ($ (0,0)! 1! 30:(0,4)$) coordinate(a) node[anchor=east] {a}
  ($ (0,0)!2cm! (a)$) coordinate(b) node[anchor=east] {b}
  ($ (0,0)!2cm!-15:(a)$) coordinate(c) node[anchor=north] {c}
  ($ (0,0)!2cm!-30:(a)$) coordinate(d) node[anchor=west] {d};
\draw[-open triangle 90]
  (b) .. controls (c) .. (d);

```

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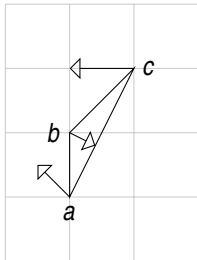
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Coordinate Computations: Projection Modifiers



L^AT_EX Input

```

\begin{tikzpicture}[>=open triangle 90]
\draw[help lines] (0,0) grid +(3,4);
\draw (1,1) coordinate(a) node[anchor=north] {$a$}
      -- (1,2) coordinate(b) node[anchor=west] {$b$}
      -- (2,3) coordinate(c) node[anchor=west] {$c$}
      -- cycle;
\draw[->] (b) -- ($ (a)!(b)!(c) $);
\draw[->] (c) -- ($ (b)!(c)!(a) $);
\draw[->] (a) -- ($ (c)!(a)!(b) $);
\end{tikzpicture}

```

Structuring Pictures with Styles

- control** Let style make things stand out more/less.
- consistency** Guarantees consistent appearance.
- reusability** Define style once, use several times.
- simplicity** Easier to use. Avoids errors.
- refinement** Allows stepwise refinement.
- maintenance** Make easy changes which global effect.

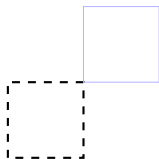
Using Styles: `\tikzset`



LA_TE_X Input

```
\tikzset{Cork/.style={red,dashed,thick}}  
\draw[Cork] (0,0) rectangle (1,1);
```


Local Style Changes



L^AT_EX Input

```
\tikzset{thick dashed/.style={thick,dashed}}
\begin{tikzpicture}[{help lines/.style={ultra thin,blue!30}}]
\draw[thick dashed] (0,0) rectangle (1,1);
\draw[help lines] (1,1) rectangle (2,2);
\end{tikzpicture}
```

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The `foreach` Command

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L^AT_EX Input

```
\foreach \pos/\text in {{0,0}/1,  
                        {1,0}/2,  
                        {1,1}/3,  
                        {0,1}/4} {  
  \draw (\pos) node {\text};  
}
```

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Command	Yields
<code>\foreach \x in {1,2,...,6} {\x,}</code>	1, 2, 3, 4, 5, 6,
<code>\foreach \x in {1,3,...,10} {\x,}</code>	1, 3, 5, 7, 9,
<code>\foreach \x in {1,3,...,11} {\x,}</code>	1, 3, 5, 7, 9, 11,
<code>\foreach \x in {0,0.1,...,0.3} {\x,}</code>	0, 0.1, 0.20001, 0.30002,
<code>\foreach \x in {a,b,...,d,9,8,...,6} {\x,}</code>	a, b, c, d, 9, 8, 7, 6,
<code>\foreach \x in {7,5,...,0} {\x,}</code>	7, 5, 3, 1,
<code>\foreach \x in {Z,X,...,M} {\x,}</code>	Z, X, V, T, R, P, N,
<code>\foreach \x in {1,...,5} {\x,}</code>	1, 2, 3, 4, 5,
<code>\foreach \x in {5,...,1} {\x,}</code>	5, 4, 3, 2, 1,
<code>\foreach \x in {a,...,e} {\x,}</code>	a, b, c, d, e,
<code>\foreach \x in {2^1,2^... ,2^6} {\\$x\$,}</code>	$2^1, 2^2, 2^3, 2^4, 2^5, 2^6$
<code>\foreach \x in {0\pi,0.5\pi,...\pi,2\pi} {\\$x\$,}</code>	$0\pi, 0.5\pi, 1.5\pi, 2.0\pi,$
<code>\foreach \x in {A_1,..._1,D_1} {\\$x\$,}</code>	$A_1, B_1, C_1, D_1,$

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AMS American Mathematical Society

API Application Programming Interface

APL A Programming Language

CTAN Comprehensive T_EX Archive Network

CD Compact Disk

FAQ Frequently Asked Question

GUI Graphical User Interface

IDE Integrated Development Environment

ISBN International Standard Book Number

SI Système International d'Unités/International System of Units

OS Operating System

TUG T_EX Users Group

URL Uniform Resource Locator

WYSIWYG What You See is What You Get

About this Document

- This document was created with `pdflatex`.
- The L^AT_EX document class is `beamer`.
- The main font is *T_EX Gyre Heros Condensed*.
 - You may obtain the font from <http://www.gust.org.pl>.