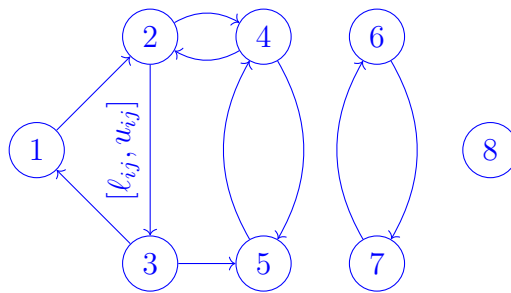


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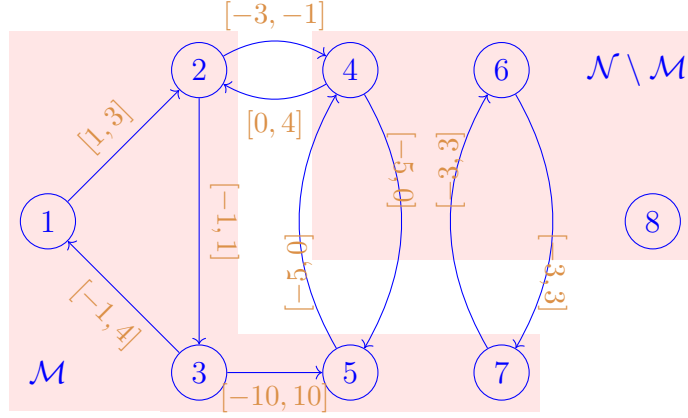


```

\begin{center}
\begin{tikzpicture}[blue, scale=1.5]
  \node[draw,circle] (V1) at (0,1) {1};
  \node[draw,circle] (V2) at (1,2) {2};
  \node[draw,circle] (V3) at (1,0) {3};
  \node[draw,circle] (V4) at (2,2) {4};
  \node[draw,circle] (V5) at (2,0) {5};
  \node[draw,circle] (V6) at (3,2) {6};
  \node[draw,circle] (V7) at (3,0) {7};
  \node[draw,circle] (V8) at (4,1) {8};
  \draw[->] (V1) -- (V2);
  \draw[->] (V3) -- (V1);
  \draw[->] (V2) -- (V3) node[midway, sloped, above] {$[\ell_{ij}, u_{ij}]$};
  \draw[->] (V3) -- (V5);
  \draw[->] (V2) to[bend left] (V4);
  \draw[->] (V4) to[bend left] (V2);
  \draw[->] (V5) to[bend left] (V4);
  \draw[->] (V4) to[bend left] (V5);
  \draw[->] (V7) to[bend left] (V6);
  \draw[->] (V6) to[bend left] (V7);
\end{tikzpicture}
\end{center}

```

Figure 1: graph-01.tex: Anotated network



```

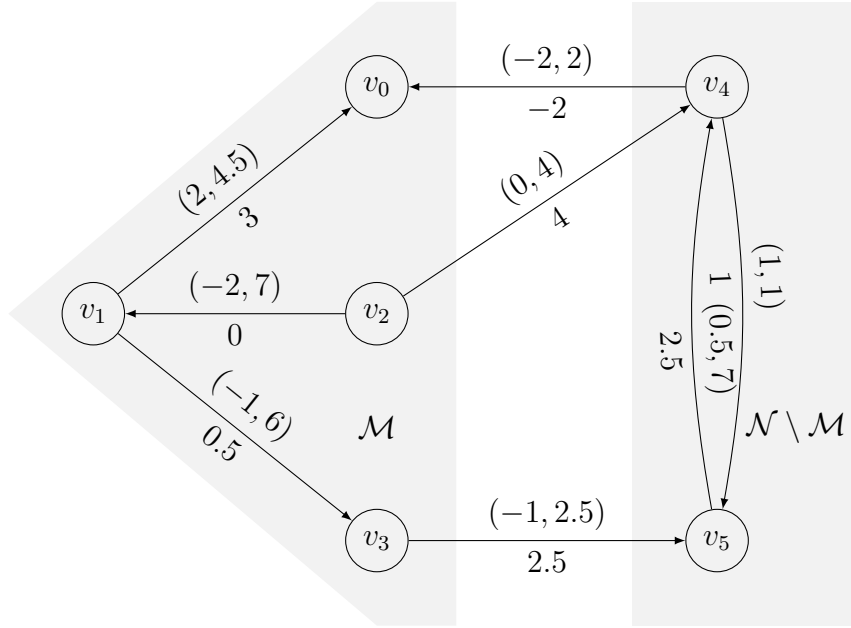
\definecolor{cof}{RGB}{219,144,71}
\pgfdeclarelayer{bg}
\pgfsetlayers{bg, main}
\begin{tikzpicture}[blue,scale=2]
  \node[draw,circle] (V1) at (0,1) {1};
  \node[draw,circle] (V2) at (1,2) {2};
  \node[draw,circle] (V3) at (1,0) {3};
  \node[draw,circle] (V4) at (2,2) {4};
  \node[draw,circle] (V5) at (2,0) {5};
  \node[draw,circle] (V6) at (3,2) {6};
  \node[draw,circle] (V7) at (3,0) {7};
  \node[draw,circle] (V8) at (4,1) {8};

  \draw[->] (V1) -- (V2) node[midway,above,cof,sloped] {\small$[1,3]$};
  \draw[->] (V3) -- (V1) node[midway,below,cof,sloped] {\small$[-1,4]$};
  \draw[->] (V2) -- (V3) node[midway,above,cof,sloped] {\small$[1,1]$};
  \draw[->] (V3) -- (V5) node[midway,below,cof,sloped] {\small$[-10,10]$};
  \draw[->] (V2) to[bend left] node[midway,above,cof,sloped] {\small$[-3,-1]$} (V4);
  \draw[->] (V4) to[bend left] node[midway,below,cof,sloped] {\small$[0,4]$} (V2);
  \draw[->] (V5) to[bend left] node[midway,left,cof,sloped] {\small$[-5,0]$} (V4);
  \draw[->] (V4) to[bend left] node[midway,left,cof,sloped] {\small$[-5,0]$} (V5);
  \draw[->] (V7) to[bend left] node[midway,right,cof,sloped] {\small$[-3,3]$} (V6);
  \draw[->] (V6) to[bend left] node[midway,right,cof,sloped] {\small$[-3,3]$} (V7);

  \begin{pgfonlayer}{bg}
    \node[fill=red!10,fit=(V4) (V6) (V8)] {};
    \node[fill=red!10,fit=(V1) (V2) (V3)] {};
    \node[fill=red!10,fit=(V3) (V5) (V7)] {};
    \draw (3.9,2) node {\mathcal{N}\setminus\mathcal{M}};
    \draw (0,0) node {\mathcal{M}};
  \end{pgfonlayer}
\end{tikzpicture}

```

Figure 2: graph-02.tex: Network with set of nodes



```

\begin{tikzpicture}[scale = 1.5]
  \fill[
    opacity=0.2,
    lightgray!20
  ] (-1.75, 0) -- (1.5, 2.75) -- (2.2, 2.75) -- (2.2, -2.75) -- (1.5, -2.75) -- cycle ;
  \fill[
    opacity=0.2,
    lightgray!20
  ] (3.75, 2.75) -- (5.75, 2.75) -- (5.75, -2.75) -- (3.75, -2.75) -- cycle ;

  \draw node[circle, draw] (v0) at (1.5, 2) {$v_0$};
  \draw node[circle, draw] (v2) at (1.5, 0) {$v_2$};
  \draw node[circle, draw] (v3) at (1.5, -2) {$v_3$};
  \draw node[circle, draw] (v1) at (-1, 0) {$v_1$};
  \draw node[circle, draw] (v4) at (4.5, 2) {$v_4$};
  \draw node[circle, draw] (v5) at (4.5, -2) {$v_5$};

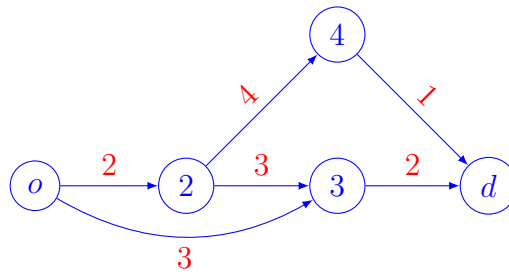
  \draw[-latex] (v1) -- (v0) node[
    midway,
    sloped,
    above
  ] {(2, 4.5)} node[midway, sloped, below] {3};
  \draw[-latex] (v2) -- (v1)
    node[midway, above] {(-2, 7)}
    node[midway, below] {0};
  \draw[-latex] (v3) -- (v5)
    node[midway, above] {(-1, 2.5)}
    node[midway, below] {2.5};
  \draw[-latex] (v2) -- (v4)
    node[midway, sloped, above] {(0, 4)}
    node[midway, sloped, below] {4};
  \draw[-latex] (v4) to[bend left=10]
    node[midway, sloped, above, pos=0.4] {(1, 1)}
    node[midway, sloped, below, pos=0.4] {1} (v5) ;
  \draw[-latex] (v5) to[bend left=10]
    node[midway, sloped, above, pos=0.4] {(0.5, 7)}
    node[midway, sloped, below, pos=0.4] {2.5} (v4);
  \draw[-latex] (v1) -- (v3)
    node[midway, sloped, above] {(-1, 6)}
    node[midway, sloped, below] {0.5};
  \draw[-latex] (v4) -- (v0)
    node[midway, above] {(-2, 2)}
    node[midway, below] {-2};

  \node at (1.5, -1) {\mathcal{M}};
  \node at (5.2, -1) {\mathcal{N} \setminus \mathcal{M}};

\end{tikzpicture}

```

Figure 3: graph-13.tex: Network with set of nodes



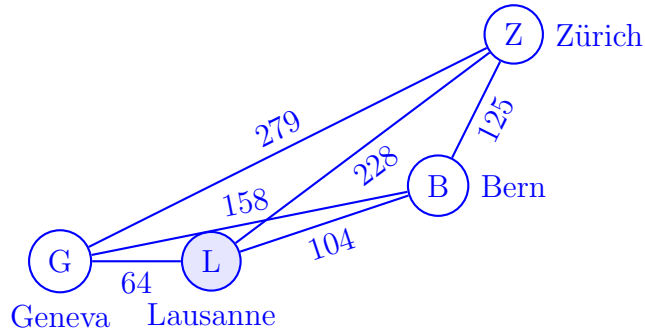
```

\begin{tikzpicture}[blue, scale=2]
  \node[draw, circle] (V1) at (0,0) {$o$};
  \node[draw, circle] (V2) at (1,0) {$2$};
  \node[draw, circle] (V3) at (2,0) {$3$};
  \node[draw, circle] (V4) at (2,1) {$4$};
  \node[draw, circle] (V5) at (3,0) {$d$};

  \draw[-latex] (V1) -- (V2) node[midway,above,red] {$2$};
  \draw[-latex] (V2) -- (V3) node[midway,above,red] {$3$};
  \draw[-latex] (V3) -- (V5) node[midway,above,red] {$2$};
  \draw[-latex] (V2) -- (V4) node[midway,above,sloped,red] {$4$};
  \draw[-latex] (V4) -- (V5) node[midway,above,sloped,red] {$1$};
  \draw[-latex] (V1) to[bend right] node[midway,below,red] {$3$} (V3);
\end{tikzpicture}

```

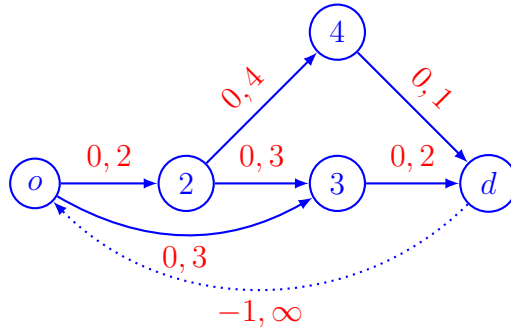
Figure 4: graph-03.tex: Simple network with node and link labels



```
\begin{tikzpicture}[blue,thick]
  \node (NG) at (0, 0) [circle, draw, label=below:Geneva] {G} ;
  \node (NL) at (2, 0) [circle, fill=blue!10, draw, label=below:Lausanne] {L} ;
  \node (NB) at (5, 1) [circle, draw, label=right:Bern] {B} ;
  \node (NZ) at (6, 3) [circle, draw, label=right:Z\`urich] {Z} ;

  \draw (NG) -- (NL) node[midway, below] {$64$} ;
  \draw (NG) -- (NB) node[midway, above, sloped] {$158$} ;
  \draw (NG) -- (NZ) node[midway, above, sloped] {$279$} ;
  \draw (NL) -- (NB) node[midway, below, sloped] {$104$} ;
  \draw (NL) -- (NZ) node[midway, below, sloped] {$228$} ;
  \draw (NZ) -- (NB) node[midway, below, sloped] {$125$} ;
\end{tikzpicture}
```

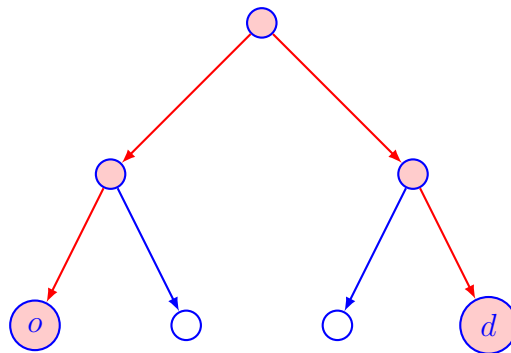
Figure 5: graph-12.tex: Network with node and link labels



```
\begin{tikzpicture}[blue,thick,scale=2]
  \node[draw, circle] (V1) at (0, 0) {$o$};
  \node[draw, circle] (V2) at (1, 0) {$2$};
  \node[draw, circle] (V3) at (2, 0) {$3$};
  \node[draw, circle] (V4) at (2, 1) {$4$};
  \node[draw, circle] (V5) at (3, 0) {$d$};

  \draw[-latex] (V1) -- (V2) node[midway,above,red] {$0, 2$};
  \draw[-latex] (V2) -- (V3) node[midway,above,red] {$0, 3$};
  \draw[-latex] (V3) -- (V5) node[midway,above,red] {$0, 2$};
  \draw[-latex] (V2) -- (V4) node[midway,above,sloped,red] {$0, 4$};
  \draw[-latex] (V4) -- (V5) node[midway,above,sloped,red] {$0, 1$};
  \draw[-latex,dotted] (V5) to[bend left=45, -] node[midway, below, red] {$-1, \infty$} (V1) ;
\end{tikzpicture}
```

Figure 6: graph-04.tex: Simple network with bending and doted link



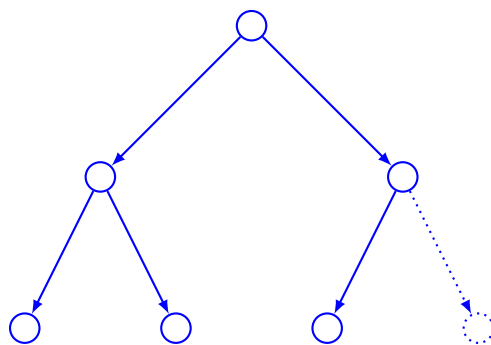
```

\begin{tikzpicture}[blue, thick]
  \node[draw, circle, fill=red!20] (V1) at (3, 4) {};
  \node[draw, circle, fill=red!20] (V2) at (1, 2) {};
  \node[draw, circle, fill=red!20] (V3) at (5, 2) {};
  \node[draw, circle, fill=red!20] (V4) at (0, 0) {$o$};
  \node[draw, circle] (V5) at (2, 0) {};
  \node[draw, circle] (V6) at (4, 0) {};
  \node[draw, circle, fill=red!20] (V7) at (6, 0) {$d$};

  \draw[-latex, red] (V1) -- (V2);
  \draw[-latex, red] (V1) -- (V3);
  \draw[-latex, red] (V2) -- (V4);
  \draw[-latex] (V2) -- (V5);
  \draw[-latex] (V3) -- (V6);
  \draw[-latex, red] (V3) -- (V7);
\end{tikzpicture}

```

Figure 7: graph-05.tex: Tree with color and node labels



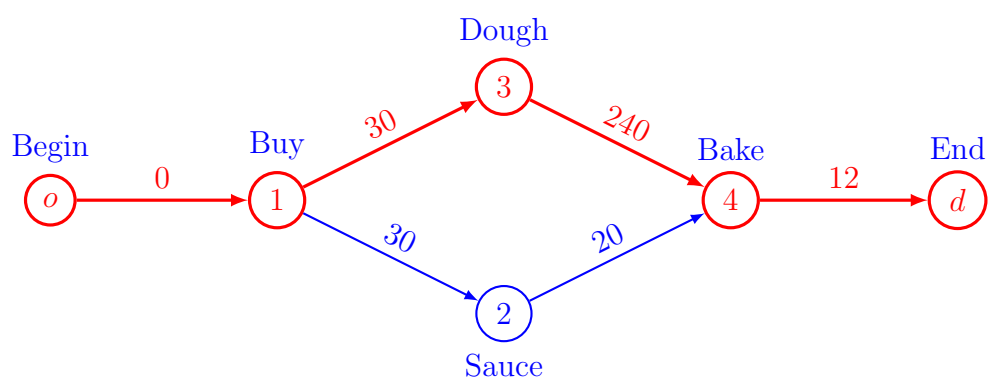
```

\begin{tikzpicture}[blue, thick]
  \node[draw, circle] (V1) at (3, 4) {};
  \node[draw, circle] (V2) at (1, 2) {};
  \node[draw, circle] (V3) at (5, 2) {};
  \node[draw, circle] (V4) at (0, 0) {};
  \node[draw, circle] (V5) at (2, 0) {};
  \node[draw, circle] (V6) at (4, 0) {};
  \node[draw, dotted, circle] (V7) at (6, 0) {};

  \draw[-latex] (V1) -- (V2);
  \draw[-latex] (V1) -- (V3);
  \draw[-latex] (V2) -- (V4);
  \draw[-latex] (V2) -- (V5);
  \draw[-latex] (V3) -- (V6);
  \draw[-latex, dotted] (V3) -- (V7);
\end{tikzpicture}

```

Figure 8: graph-06.tex: Tree with dotted link



```

\begin{tikzpicture}[blue, thick, scale=1.5]

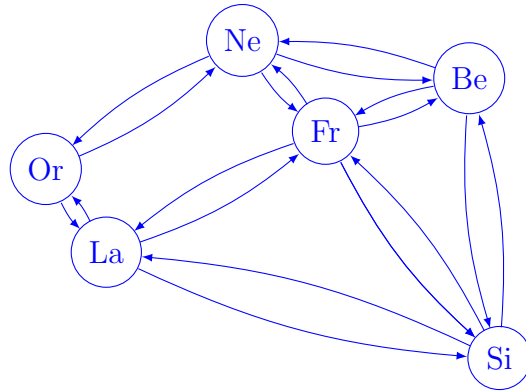
\draw[red, very thick] (0,1) -- (1,1) node[midway, above] {0$};
\draw[red, very thick] (1,1) -- (2,0) node[midway, above, sloped] {30$};
\draw[red, very thick] (1,1) -- (2,2) node[midway, above, sloped] {30$};
\draw[blue, very thick] (2,2) -- (3,1) node[midway, above, sloped] {20$};
\draw[red, very thick] (2,0) -- (3,1) node[midway, above, sloped] {240$};
\draw[red, very thick] (3,1) -- (4,1) node[midway, above] {12$};

\draw[red, very thick] (0,1) circle[radius=0.5] node[above] {Begin};
\draw[red, very thick] (1,1) circle[radius=0.5] node[above] {Buy};
\draw[blue, very thick] (2,2) circle[radius=0.5] node[below] {Sauce};
\draw[blue, very thick] (2,0) circle[radius=0.5] node[below] {Dough};
\draw[red, very thick] (3,1) circle[radius=0.5] node[above] {Bake};
\draw[red, very thick] (4,1) circle[radius=0.5] node[above] {End};

\end{tikzpicture}

```

Figure 9: graph-07.tex: Network with two node labels



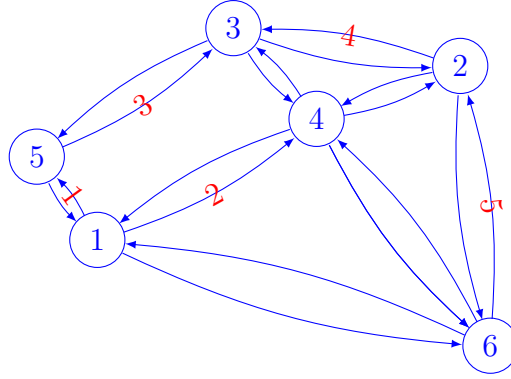
```

\begin{tikzpicture}[blue, scale=6]
  \node[draw, circle] (LA) at (6.6667, 46.5333) {La};
  \node[draw, circle] (BE) at (7.4667, 46.9167) {Be};
  \node[draw, circle] (NE) at (6.9667, 47) {Ne};
  \node[draw, circle] (FR) at (7.15, 46.8) {Fr};
  \node[draw, circle] (OR) at (6.5333, 46.7167) {Or};
  \node[draw, circle] (SI) at (7.5333, 46.3) {Si};

  \draw[-latex] (LA) to[bend right=10] (OR) ;
  \draw[-latex] (LA) to[bend right=10] (FR) ;
  \draw[-latex] (LA) to[bend right=10] (SI) ;
  \draw[-latex] (BE) to[bend right=10] (NE) ;
  \draw[-latex] (BE) to[bend right=10] (FR) ;
  \draw[-latex] (BE) to[bend right=10] (SI) ;
  \draw[-latex] (NE) to[bend right=10] (OR) ;
  \draw[-latex] (NE) to[bend right=10] (FR) ;
  \draw[-latex] (NE) to[bend right=10] (BE) ;
  \draw[-latex] (FR) to[bend right=10] (LA) ;
  \draw[-latex] (FR) to[bend right=10] (NE) ;
  \draw[-latex] (FR) to[bend right=10] (BE) ;
  \draw[-latex] (FR) to[bend right=10] (SI) ;
  \draw[-latex] (FR) to[bend right=10] (SI) ;
  \draw[-latex] (OR) to[bend right=10] (NE) ;
  \draw[-latex] (OR) to[bend right=10] (LA) ;
  \draw[-latex] (SI) to[bend right=10] (LA) ;
  \draw[-latex] (SI) to[bend right=10] (FR) ;
  \draw[-latex] (SI) to[bend right=10] (BE) ;
\end{tikzpicture}

```

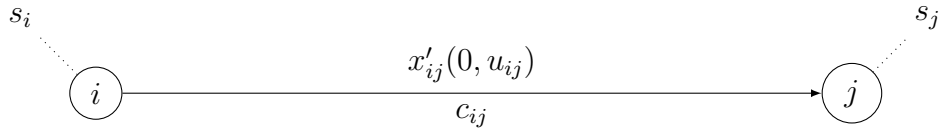
Figure 10: graph-08.tex: Network with double links



```
\begin{tikzpicture}[blue, scale=6]
\node[draw, circle] (LA) at (6.6667, 46.5333) {1};
\node[draw, circle] (BE) at (7.4667, 46.9167) {2};
\node[draw, circle] (NE) at (6.9667, 47) {3};
\node[draw, circle] (FR) at (7.15, 46.8) {4};
\node[draw, circle] (OR) at (6.5333, 46.7167) {5};
\node[draw, circle] (SI) at (7.5333, 46.3) {6};

\draw[-latex] (LA) to[bend right=10] node[midway, sloped, red] {1} (OR);
\draw[-latex] (LA) to[bend right=10] node[midway, sloped, red] {2} (FR);
\draw[-latex] (LA) to[bend right=10] (SI);
\draw[-latex] (BE) to[bend right=10] node[midway, sloped, red] {4} (NE);
\draw[-latex] (BE) to[bend right=10] (FR);
\draw[-latex] (BE) to[bend right=10] (SI);
\draw[-latex] (NE) to[bend right=10] (OR);
\draw[-latex] (NE) to[bend right=10] (FR);
\draw[-latex] (NE) to[bend right=10] (BE);
\draw[-latex] (FR) to[bend right=10] (LA);
\draw[-latex] (FR) to[bend right=10] (NE);
\draw[-latex] (FR) to[bend right=10] (BE);
\draw[-latex] (FR) to[bend right=10] (SI);
\draw[-latex] (FR) to[bend right=10] (SI);
\draw[-latex] (OR) to[bend right=10] node[midway, sloped, red] {3} (NE);
\draw[-latex] (OR) to[bend right=10] (LA);
\draw[-latex] (SI) to[bend right=10] (LA);
\draw[-latex] (SI) to[bend right=10] (FR);
\draw[-latex] (SI) to[bend right=10] node[midway, sloped, red] {5} (BE);
\end{tikzpicture}
```

Figure 11: graph-11.tex: Network with double links and labels



```
\begin{tikzpicture}
\node[draw, circle] (Vi) at (0, 0) {$i$};
\node[draw, circle] (Vj) at (10, 0) {$j$};
\node (si) at (-1, 1) {$s_i$};
\node (sj) at (11, 1) {$s_j$};
\draw[dotted] (si) -- (Vi);
\draw[dotted] (sj) -- (Vj);
\draw[-latex] (Vi) -- (Vj) node[midway, above]
{$x'_{ij}(0, u_{ij})$} node[midway, below] {$c_{ij}$};
\end{tikzpicture}
```

Figure 12: graph-09.tex: One annotated link

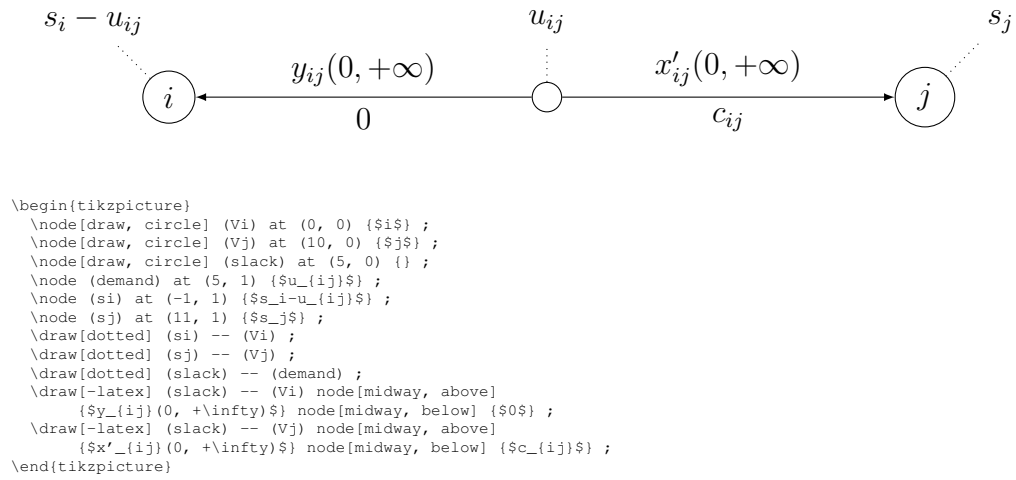
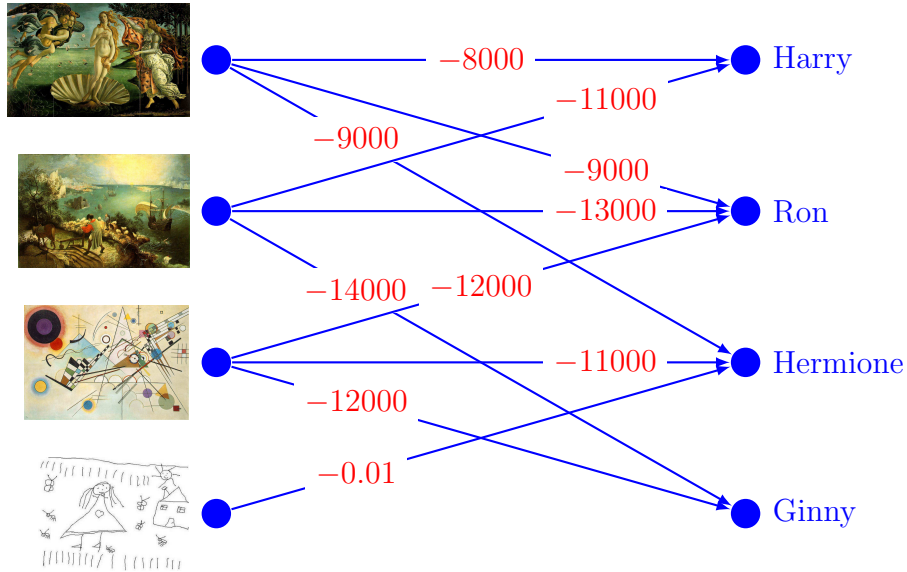


Figure 13: graph-10.tex: Two annotated links



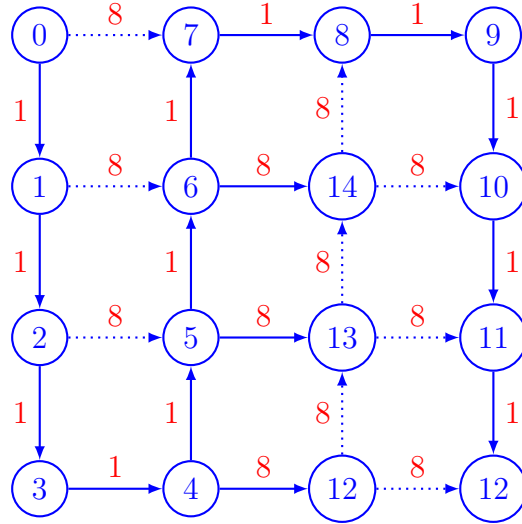
```

\begin{tikzpicture}[blue, thick]
  \node (Bier) at (0, 0) [
    circle,
    fill,
    label=left:\epsfig{figure=Bierlaire1971, height=1.5cm}
  ] {};
  \node (Kand) at (0, 2) [
    circle,
    fill,
    label=left:\epsfig{figure=kandinski1923, height=1.5cm}
  ] {};
  \node (Brue) at (0, 4) [
    circle,
    fill,
    label=left:\epsfig{figure=Bruegel1558, height=1.5cm}
  ] {};
  \node (Bott) at (0, 6) [
    circle,
    fill,
    label=left:\epsfig{figure=botticelli1485, height=1.5cm}
  ] {};
  \node (Ginn) at (7, 0) [
    circle,
    fill,
    label=right:Ginny
  ] {};
  \node (Herm) at (7, 2) [
    circle,
    fill,
    label=right:Hermione
  ] {};
  \node (Ron) at (7, 4) [
    circle,
    fill,
    label=right:Ron
  ] {};
  \node (Harr) at (7, 6) [
    circle,
    fill,
    label=right:Harry
  ] {};

  \draw[>, -latex] (Bott) -- (Harr) node[midway, text=red, fill=white] {$-8000$};
  \draw[>, -latex] (Bott) -- (Ron) node[near end, text=red, fill=white] {$-9000$};
  \draw[>, -latex] (Bott) -- (Herm) node[near start, text=red, fill=white] {$-9000$};
  \draw[>, -latex] (Brue) -- (Harr) node[near end, text=red, fill=white] {$-11000$};
  \draw[>, -latex] (Brue) -- (Ron) node[near end, text=red, fill=white] {$-13000$};
  \draw[>, -latex] (Brue) -- (Ginn) node[near start, text=red, fill=white] {$-14000$};
  \draw[>, -latex] (Kand) -- (Ron) node[midway, text=red, fill=white] {$-12000$};
  \draw[>, -latex] (Kand) -- (Herm) node[near end, text=red, fill=white] {$-11000$};
  \draw[>, -latex] (Kand) -- (Ginn) node[near start, text=red, fill=white] {$-12000$};
  \draw[>, -latex] (Bier) -- (Herm) node[near start, text=red, fill=white] {$-0.01$};
\end{tikzpicture}

```

Figure 14: graph-14.tex: Network with pictures



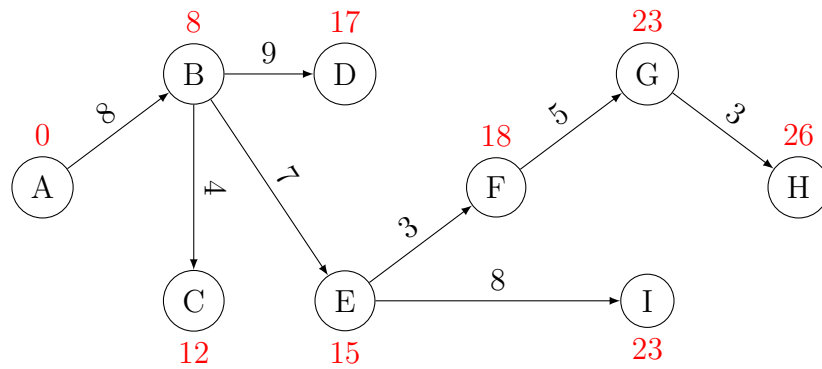
```

\begin{tikzpicture}[blue, thick]
  \node (N01) at (0, 6) [circle, draw] {0} ;
  \node (N02) at (2, 6) [circle, draw] {7} ;
  \node (N03) at (4, 6) [circle, draw] {8} ;
  \node (N04) at (6, 6) [circle, draw] {9} ;
  \node (N05) at (0, 4) [circle, draw] {1} ;
  \node (N06) at (2, 4) [circle, draw] {6} ;
  \node (N07) at (4, 4) [circle, draw] {14} ;
  \node (N08) at (6, 4) [circle, draw] {10} ;
  \node (N09) at (0, 2) [circle, draw] {2} ;
  \node (N10) at (2, 2) [circle, draw] {5} ;
  \node (N11) at (4, 2) [circle, draw] {13} ;
  \node (N12) at (6, 2) [circle, draw] {11} ;
  \node (N13) at (0, 0) [circle, draw] {3} ;
  \node (N14) at (2, 0) [circle, draw] {4} ;
  \node (N15) at (4, 0) [circle, draw] {12} ;
  \node (N16) at (6, 0) [circle, draw] {12} ;

  \draw[-latex, dotted] (N01) -- (N02) node[midway, red, above] {$8$} ;
  \draw[-latex] (N01) -- (N05) node[midway, red, left] {$1$} ;
  \draw[-latex] (N02) -- (N03) node[midway, red, above] {$1$} ;
  \draw[-latex] (N03) -- (N04) node[midway, red, above] {$1$} ;
  \draw[-latex] (N04) -- (N08) node[midway, red, right] {$1$} ;
  \draw[-latex, dotted] (N05) -- (N06) node[midway, red, above] {$8$} ;
  \draw[-latex] (N05) -- (N09) node[midway, red, left] {$1$} ;
  \draw[-latex] (N06) -- (N07) node[midway, red, above] {$8$} ;
  \draw[-latex] (N06) -- (N02) node[midway, red, left] {$1$} ;
  \draw[-latex, dotted] (N07) -- (N08) node[midway, red, above] {$8$} ;
  \draw[-latex, dotted] (N07) -- (N03) node[midway, red, left] {$8$} ;
  \draw[-latex] (N08) -- (N12) node[midway, red, right] {$1$} ;
  \draw[-latex, dotted] (N09) -- (N10) node[midway, red, above] {$8$} ;
  \draw[-latex] (N09) -- (N13) node[midway, red, left] {$1$} ;
  \draw[-latex] (N10) -- (N11) node[midway, red, above] {$8$} ;
  \draw[-latex] (N10) -- (N06) node[midway, red, left] {$1$} ;
  \draw[-latex, dotted] (N11) -- (N12) node[midway, red, above] {$8$} ;
  \draw[-latex, dotted] (N11) -- (N07) node[midway, red, left] {$8$} ;
  \draw[-latex] (N12) -- (N16) node[midway, red, right] {$1$} ;
  \draw[-latex] (N13) -- (N14) node[midway, red, above] {$1$} ;
  \draw[-latex] (N14) -- (N15) node[midway, red, above] {$8$} ;
  \draw[-latex] (N14) -- (N10) node[midway, red, left] {$1$} ;
  \draw[-latex, dotted] (N15) -- (N16) node[midway, red, above] {$8$} ;
  \draw[-latex, dotted] (N15) -- (N11) node[midway, red, left] {$8$} ;
\end{tikzpicture}

```

Figure 15: graph-15.tex: Grid network

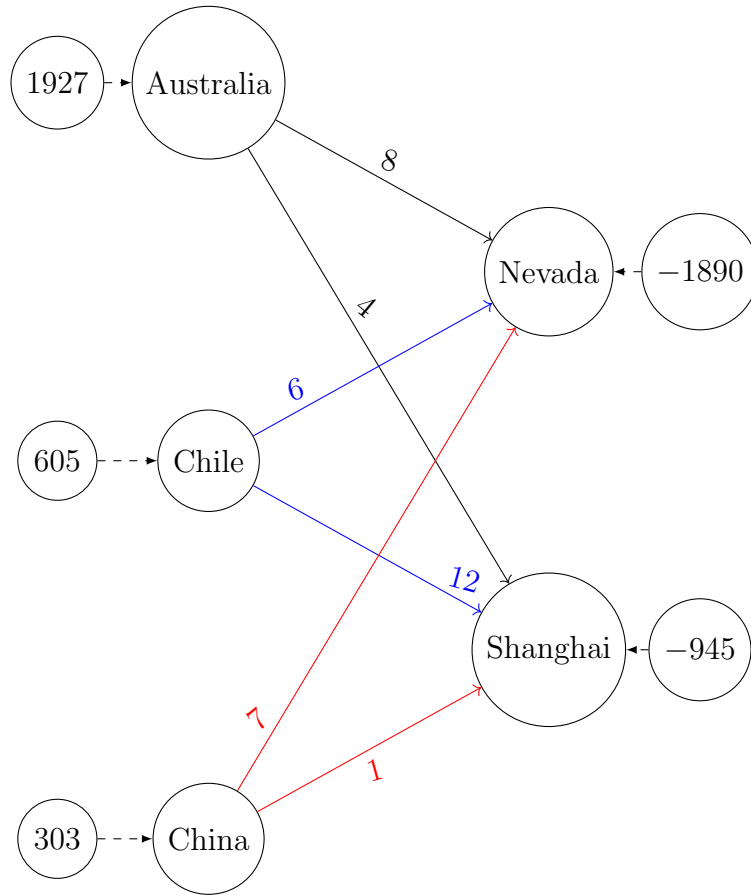


```

\begin{tikzpicture}
\node[shape=circle, draw=black, label={[red]$0$}] (1) at (0, 0) {A};
\node[shape=circle, draw=black, label={[red]$8$}] (2) at (2, 1.5) {B};
\node[shape=circle, draw=black, label={[red]below:$12$}] (3) at (2, -1.5) {C};
\node[shape=circle, draw=black, label={[red]$17$}] (4) at (4, 1.5) {D};
\node[shape=circle, draw=black, label={[red]below:$15$}] (5) at (4, -1.5) {E};
\node[shape=circle, draw=black, label={[red]$18$}] (6) at (6, 0) {F};
\node[shape=circle, draw=black, label={[red]$23$}] (7) at (8, 1.5) {G};
\node[shape=circle, draw=black, label={[red]$26$}] (8) at (10, 0) {H};
\node[shape=circle, draw=black, label={[red]below:$23$}] (9) at (8, -1.5) {I};
\draw[-latex] (1) -- (2) node[midway, sloped, above] {8};
\draw[-latex] (2) -- (4) node[midway, sloped, above] {9};
\draw[-latex] (2) -- (5) node[midway, sloped, above] {7};
\draw[-latex] (2) -- (3) node[midway, sloped, above] {4};
\draw[-latex] (5) -- (6) node[midway, sloped, above] {3};
\draw[-latex] (5) -- (9) node[midway, sloped, above] {8};
\draw[-latex] (6) -- (7) node[midway, sloped, above] {5};
\draw[-latex] (7) -- (8) node[midway, sloped, above] {3};
\end{tikzpicture}

```

Figure 16: graph-16.tex: PERT network



```

\begin{tikzpicture}[xscale=0.5]
  \def\x{1}
  \def\z{10}
  \def\y{2.5}

  \node[draw=black, circle] (AUS) at (\x, 0) {Australia};
  \node[draw=black, circle] (CHI) at (\x, -2 * \y) {Chile};
  \node[draw=black, circle] (CHINA) at (\x, -4 * \y) {China};

  \node[draw=black, circle] (Nevada) at (\z, -1 * \y) {Nevada};
  \node[draw=black, circle] (Shanghai) at (\z, -3 * \y) {Shanghai};

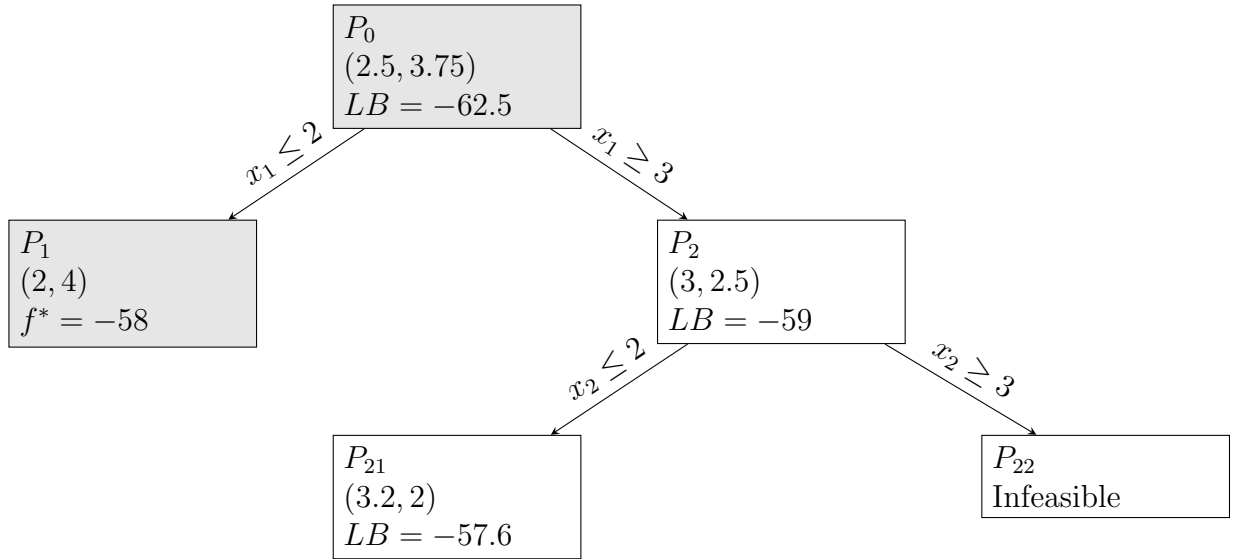
  \draw[>] (AUS) -- (Nevada) node [pos=0.5, above, sloped] {8};
  \draw[>] (AUS) -- (Shanghai) node [pos=0.4, above, sloped] {4};
  \draw[>] (CHI)[blue] -- (Nevada) node [pos=0.2, above, sloped] {6};
  \draw[>] (CHI)[blue] -- (Shanghai) node [pos=0.9, above, sloped] {12};
  \draw[>] (CHINA)[red] -- (Nevada) node [pos=0.12, above, sloped] {7};
  \draw[>] (CHINA)[red] -- (Shanghai) node [pos=0.5, below, sloped] {1};

  \draw node[circle, draw] (1) at (-3, 0 * \y) {$1927$};
  \draw node[circle, draw] (2) at (-3, -2 * \y) {$605$};
  \draw node[circle, draw] (3) at (-3, -4 * \y) {$303$};
  \draw node[circle, draw] (4) at (14, -1 * \y) {$-1890$};
  \draw node[circle, draw] (5) at (14, -3 * \y) {$-945$};

  \draw[dashed, -latex] (1)--(AUS);
  \draw[dashed, -latex] (2)--(CHI);
  \draw[dashed, -latex] (3)--(CHINA);
  \draw[dashed, -latex] (4)--(Nevada);
  \draw[dashed, -latex] (5)--(Shanghai);
\end{tikzpicture}

```

Figure 17: graph-17.tex: Large node labels using variables



```

\begin{tikzpicture}
\begin{tikzset}
>=stealth,
parent node/.style={
rectangle split,
rectangle split parts=2,
align=left,
text width=3cm,
draw,
node distance=1cm and 1cm
}
}
\node[
parent node,
rectangle split parts=1,
fill=gray!20
] (A) {$P_0$ \ \ $(2.5, 3.75)$ \ \ $LB=-62.5$};
\node[
parent node,
rectangle split parts=1,
node distance=1.2 and 1,
below left =of A,
fill=gray!20
] (B) {$P_1$ \ \ $(2,4)$ \ \ $f^*=-58$};
\node[
parent node,
rectangle split parts=1,
node distance=1.2 and 1,
below right =of A
] (C) {$P_2$ \ \ $(3,2.5)$ \ \ $LB=-59$};
\node[
parent node,
rectangle split parts=1,
node distance=1.2 and 1,
below left =of C
] (D) {$P_{21}$ \ \ $(3.2, 2)$ \ \ $LB=-57.6$};
\node[
parent node,
rectangle split parts=1,
node distance=1.2 and 1,
below right =of C
] (E) {$P_{22}$ \ \ Infeasible};

\draw[>] (A)--(B) node[midway,above,sloped] {$x_1 \leq 2$};
\draw[>] (A)--(C) node[midway,above,sloped] {$x_1 \geq 3$};
\draw[>] (C)--(D) node[midway,above,sloped] {$x_2 \leq 2$};
\draw[>] (C)--(E) node[midway,above,sloped] {$x_2 \geq 3$};
\end{tikzpicture}

```

Figure 18: graph-18.tex: Branch & Bound tree

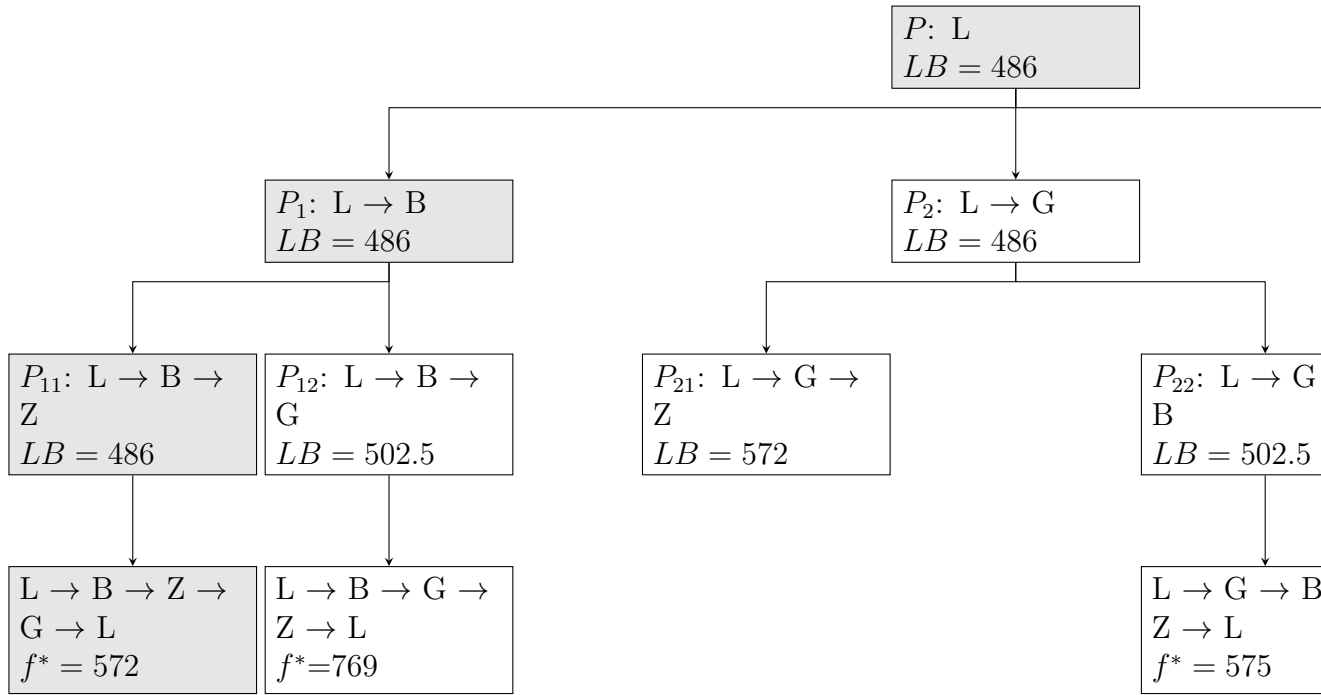
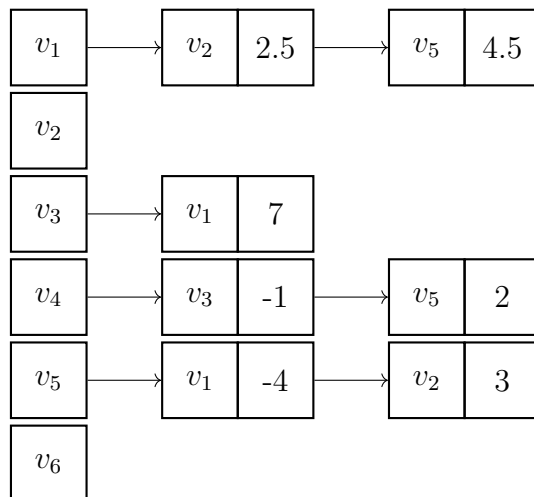


Figure 19: graph-21.tex: Branch & Bound tree

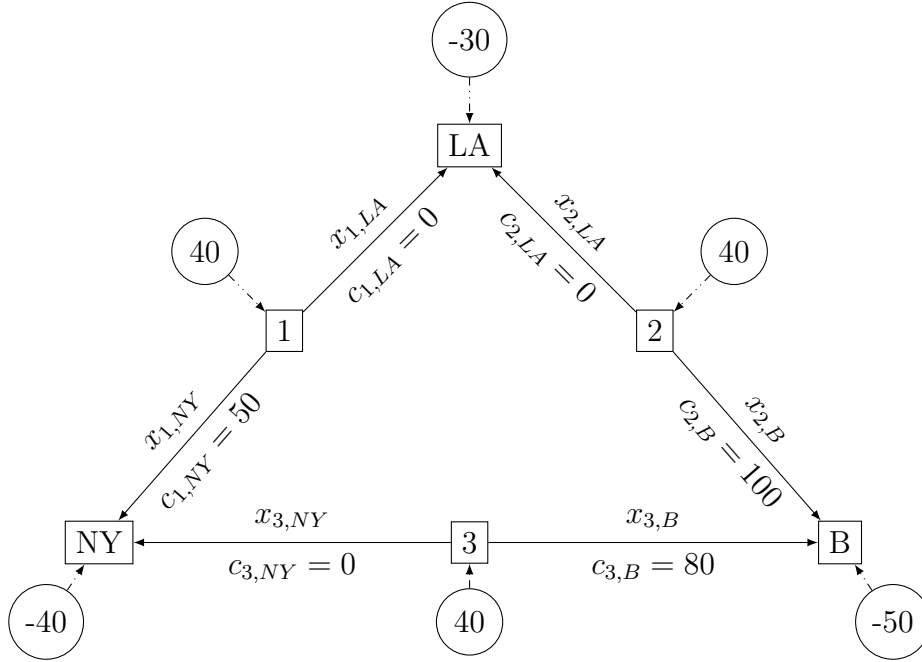


```

\begin{tikzpicture}
\begin{tikzset}{every node/.style={
draw,
thick,
minimum width=1cm,
minimum height=1cm}}
\node (rect1_1) at (0, 5.4) {$v_1$} ;
\node (rect1_2) at (2, 5.4) {$v_2$} ;
\node (rect1_3) at (3, 5.4) {$2.5$} ;
\node (rect1_4) at (5, 5.4) {$v_5$} ;
\node (rect1_5) at (6, 5.4) {$4.5$} ;
\draw[>] (rect1_1) to (rect1_2);
\draw[>] (rect1_3) to (rect1_4);
\node (rect2_1) at (0, 4.3) {$v_2$} ;
\node (rect3_1) at (0, 3.2) {$v_3$} ;
\node (rect3_2) at (2, 3.2) {$v_1$} ;
\node (rect3_3) at (3, 3.2) {$7$} ;
\draw[>] (rect3_1) to (rect3_2);
\node (rect4_1) at (0, 2.1) {$v_4$} ;
\node (rect4_2) at (2, 2.1) {$v_3$} ;
\node (rect4_3) at (3, 2.1) {$-1$} ;
\node (rect4_4) at (5, 2.1) {$v_5$} ;
\node (rect4_5) at (6, 2.1) {$2$} ;
\draw[>] (rect4_1) to (rect4_2);
\draw[>] (rect4_3) to (rect4_4);
\node (rect5_1) at (0, 1) {$v_5$} ;
\node (rect5_2) at (2, 1) {$v_1$} ;
\node (rect5_3) at (3, 1) {$-4$} ;
\node (rect5_4) at (5, 1) {$v_2$} ;
\node (rect5_5) at (6, 1) {$3$} ;
\draw[>] (rect5_1) to (rect5_2);
\draw[>] (rect5_3) to (rect5_4);
\node (rect) at (0, -0.1) {$v_6$} ;
\end{tikzpicture}

```

Figure 20: graph-19.tex: List of pointers



```

\begin{tikzpicture}[scale=0.7]
\draw node[rectangle, draw] (LA) at (0,7) {LA};
\draw node[rectangle, draw] (NY) at (-7,-0.5) {NY};
\draw node[rectangle, draw] (B) at (7,-0.5) {B};
\draw node[rectangle, draw] (1) at (-3.5,3.5) {1};
\draw node[rectangle, draw] (2) at (3.5,3.5) {2};
\draw node[rectangle, draw] (3) at (0,-0.5) {3};

\draw[-latex] (2) -- (LA)
node[midway, sloped, above] {$x_{2, LA}$}
node[midway, sloped, below] {$c_{2, LA}=0$};

\draw[-latex] (2) -- (B)
node[midway, sloped, above] {$x_{2, B}$}
node[midway, sloped, below] {$c_{2, B}=100$};

\draw[-latex] (1) -- (LA)
node[midway, sloped, above] {$x_{1, LA}$}
node[midway, sloped, below] {$c_{1, LA}=0$};

\draw[-latex] (1) -- (NY)
node[midway, sloped, above] {$x_{1, NY}$}
node[midway, sloped, below] {$c_{1, NY}=50$};

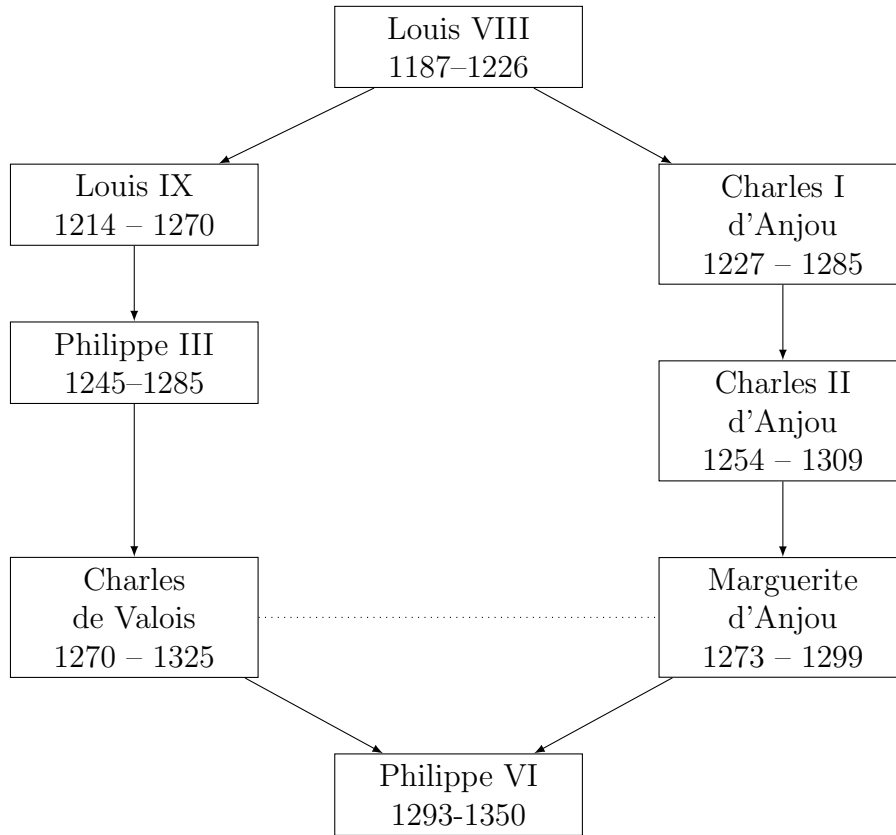
\draw[-latex] (3) -- (B)
node[midway, sloped, above] {$x_{3, B}$}
node[midway, sloped, below] {$c_{3, B}=80$};

\draw[-latex] (3) -- (NY)
node[midway, sloped, above] {$x_{3, NY}$}
node[midway, sloped, below] {$c_{3, NY}=0$};

\draw node[circle, draw] (4) at (0, 9) {-30};
\draw[-latex, dashdotdotted] (4)--(LA);
\draw node[circle, draw] (5) at (-5, 5) {40};
\draw[-latex, dashdotdotted] (5)--(1);
\draw node[circle, draw] (6) at (5, 5) {40};
\draw[-latex, dashdotdotted] (6)--(2);
\draw node[circle, draw] (7) at (-8, -2) {-40};
\draw[-latex, dashdotdotted] (7)--(NY);
\draw node[circle, draw] (8) at (8, -2) {-50};
\draw[-latex, dashdotdotted] (8)--(B);
\draw node[circle, draw] (9) at (0, -2) {40};
\draw[-latex, dashdotdotted] (9)--(3);
\end{tikzpicture}

```

Figure 21: graph-20.tex: Square and circle nodes and labels

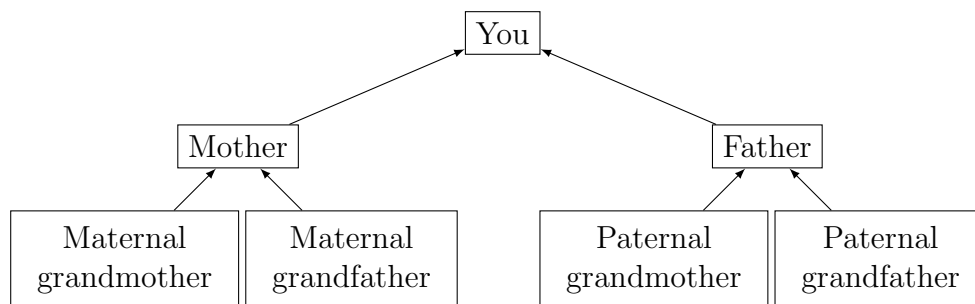


```

\tikzset{
  bnode/.style = {
    draw,
    text centered,
    text width=3cm}
}
\begin{tikzpicture}[scale=1.0, every node/.style={transform shape}]
\node[bnode] (LOUISVIII) {
  Louis VIII \ \ 1187--1226
};
\node[bnode, below left=of LOUISVIII] (LOUIS_IX) {
  Louis IX \ \ 1214 -- 1270
};
\node[bnode, below=of LOUIS_IX] (PHIL_III) {
  Philippe III \ \ 1245--1285
};
\node[bnode, below right=of LOUISVIII] (CHI_ANJOU) {
  Charles I d'Anjou\ \ 1227 -- 1285
};
\node[bnode, below=of CHI_ANJOU] (CHII_ANJOU) {
  Charles II d'Anjou\ \ 1254 -- 1309
};
\node[bnode, below=of CHII_ANJOU] (MARG_ANJOU) {
  Marguerite d'Anjou\ \ 1273 -- 1299
};
\node[bnode, below left=of MARG_ANJOU] (PH_VALOIS) {
  Philippe VI \ \ 1293-1350
};
\path let \p1=(PHIL_III), \p2=(MARG_ANJOU) in node[bnode] (CH_VALOIS) at (\x1,\y2) {
  Charles de Valois \ \ 1270 -- 1325
};
\draw[-latex] (LOUISVIII) -- (LOUIS_IX) ;
\draw[-latex] (LOUIS_IX) -- (PHIL_III) ;
\draw[-latex] (PHIL_III) -- (CH_VALOIS) ;
\draw[-latex] (CH_VALOIS) -- (PH_VALOIS) ;
\draw[-latex] (LOUISVIII) -- (CHI_ANJOU) ;
\draw[-latex] (CHI_ANJOU) -- (CHII_ANJOU) ;
\draw[-latex] (CHII_ANJOU) --(MARG_ANJOU) ;
\draw[-latex] (MARG_ANJOU) --(PH_VALOIS) ;
\draw[dotted] (CH_VALOIS) -- (MARG_ANJOU) ;
\end{tikzpicture}

```

Figure 22: graph-22.tex: Family tree with cycle



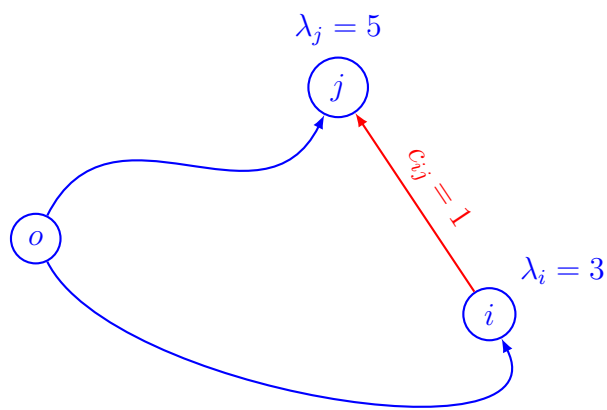
```

\begin{tikzpicture}
  \draw node[rectangle, draw] (0) at (0.5, 4) {You};
  \draw node[rectangle, draw] (1) at (-3, 2.5) {Mother};
  \draw node[rectangle, draw] (2) at (4, 2.5) {Father};
  \draw node[rectangle, draw] (3) at (-4.5, 1) {
    \begin{tabular}{c} Maternal \\ grandmother \end{tabular}
  };
  \draw node[rectangle, draw] (4) at (-1.5, 1) {
    \begin{tabular}{c} Maternal \\ grandfather \end{tabular}
  };
  \draw node[rectangle, draw] (5) at (2.5, 1) {
    \begin{tabular}{c} Paternal \\ grandmother \end{tabular}
  };
  \draw node[rectangle, draw] (6) at (5.5, 1) {
    \begin{tabular}{c} Paternal \\ grandfather \end{tabular}
  };

  \draw[latex-] (0) -- (1);
  \draw[latex-] (0) -- (2);
  \draw[latex-] (1) -- (3);
  \draw[latex-] (1) -- (4);
  \draw[latex-] (2) -- (5);
  \draw[latex-] (2) -- (6);
\end{tikzpicture}

```

Figure 23: graph-23.tex: Family tree



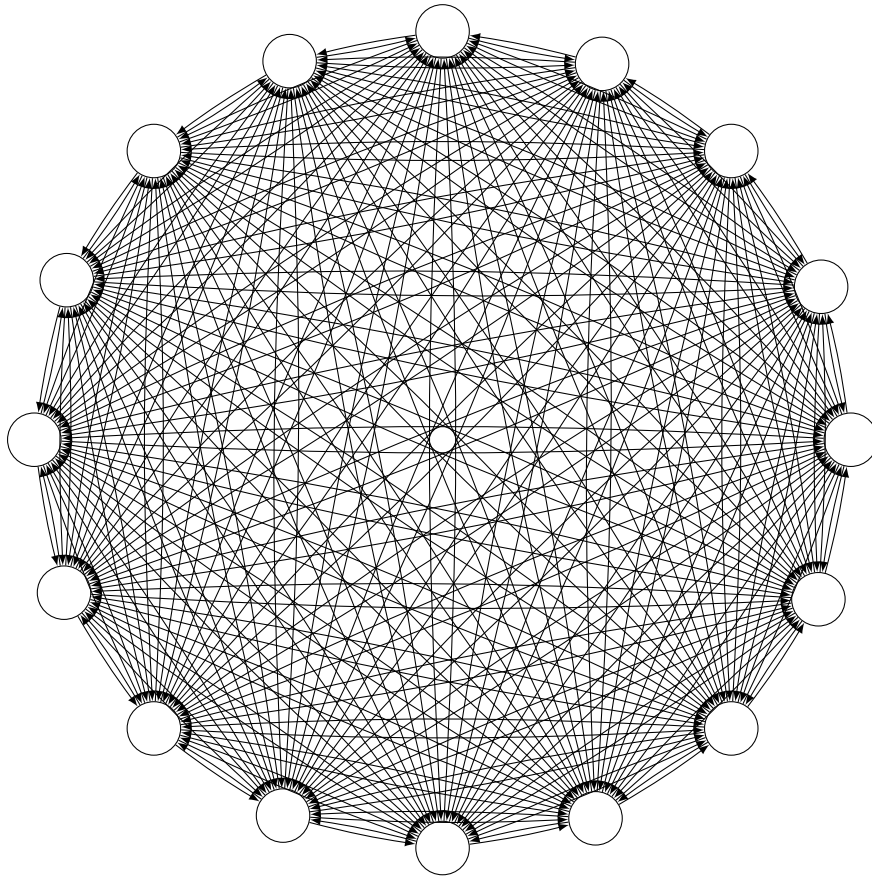
```

\begin{tikzpicture}[blue, thick]
  \node (No) at (0, 0) [circle, draw] {$o$} ;
  \node (Ni) at (6, -1) [circle, draw, label={above right}:{$\lambda_i=3$}] {$i$} ;
  \node (Nj) at (4, 2) [circle, draw, label={above right}:{$\lambda_j=5$}] {$j$} ;

  \draw[-latex] (No) .. controls +(1, 2) and +(-1, -2) .. (Nj) ;
  \draw[-latex] (No) .. controls +(1, -2) and +(-1, 2) .. (Ni) ;
  \draw[-latex, red] (Ni) -- (Nj) node[midway, sloped, above] {$c_{ij}=1$};
\end{tikzpicture}

```

Figure 24: graph-24.tex: Bezier curves

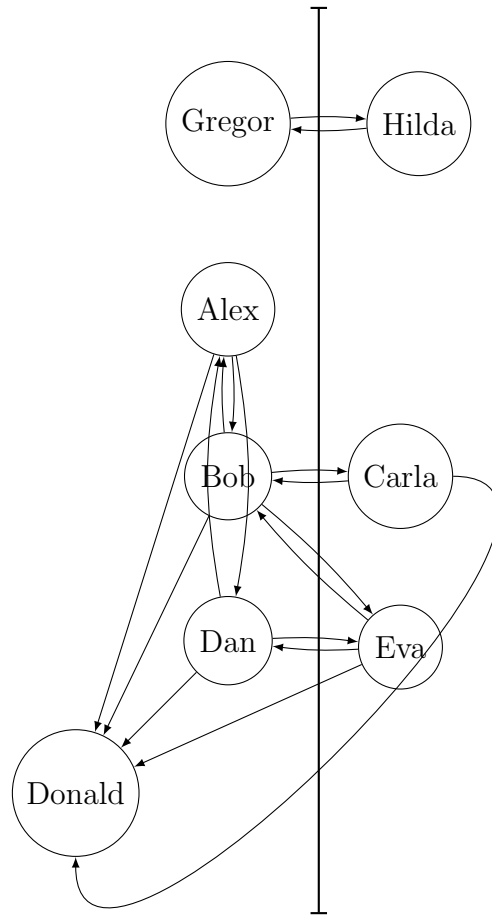


```

\newcount\mycount
\begin{tikzpicture}[transform shape]
  %the multiplication with floats is not possible. Thus I split the loop in two.
  \foreach \number in {1, ..., 8}{
    % Computer angle:
    \mycount=\number
    \advance\mycount by -1
    \multiply\mycount by 45
    \advance\mycount by 0
    \node[draw, circle, inner sep=0.25cm] (N-\number) at (\the\mycount:5.4cm) {};
  }
  \foreach \number in {9, ..., 16}{
    % Computer angle:
    \mycount=\number
    \advance\mycount by -1
    \multiply\mycount by 45
    \advance\mycount by 22.5
    \node[draw, circle, inner sep=0.25cm] (N-\number) at (\the\mycount:5.4cm) {};
  }
  \foreach \number in {1, ..., 15} {
    \mycount=\number
    \advance\mycount by 1
    \foreach \numbera in {\the\mycount, ..., 16} {
      \path (N-\number) {
        edge[-latex, bend right=3] (N-\numbera)
        edge[latex-, bend left=3] (N-\numbera)
      };
    }
  }
\end{tikzpicture}

```

Figure 25: graph-25.tex: Complex loops

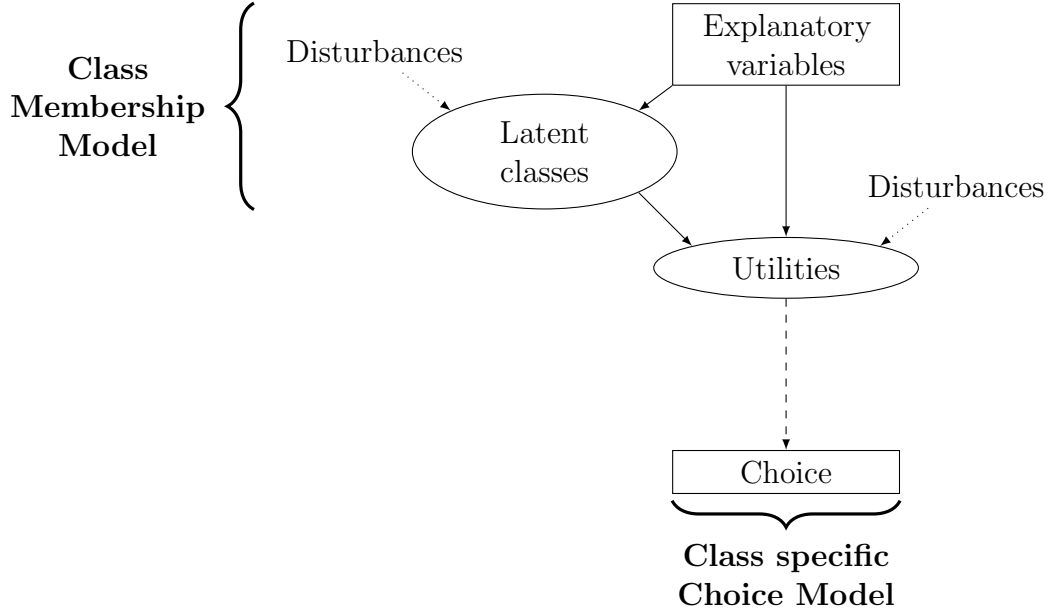


```

\begin{tikzpicture}
\draw[thick,|-|] (1.2, -8) -- (1.2, 4);
\node [circle, draw] (a) {Alex};
\node [circle, draw] (b) [below=of a] {Bob};
\node [circle, draw] (d) [below=of b] {Dan};
\node [circle, draw] (f) [below left=of d] {Donald};
\node [circle, draw] (c) [right=of b] {Carla};
\node [circle, draw] (e) [below=of c] {Eva};
\node [circle, draw] (g) [above=of a] {Gregor};
\node [circle, draw] (h) [right=of g] {Hilda};
\draw [-latex] (g) to [bend left=5] (h);
\draw [latex-] (g) to [bend right=5] (h);
\draw [-latex] (a) to (f);
\draw [-latex] (b) to (f);
\draw [-latex] (c) to [in=270, out=0] (f);
\draw [-latex] (d) to (f);
\draw [-latex] (e) to (f);
\draw [-latex] (a) to [bend left=5] (b);
\draw [-latex] (b) to [bend left=5] (c);
\draw [-latex] (d) to [bend left=5] (e);
\draw [-latex] (b) to [bend left=5] (e);
\draw [-latex] (a) to [bend left=10] (d);
\draw [latex-] (a) to [bend right=5] (b);
\draw [latex-] (b) to [bend right=5] (c);
\draw [latex-] (d) to [bend right=5] (e);
\draw [latex-] (b) to [bend right=5] (e);
\draw [latex-] (a) to [bend right=10] (d);
\end{tikzpicture}

```

Figure 26: graph-26.tex: Graph with double links and separator

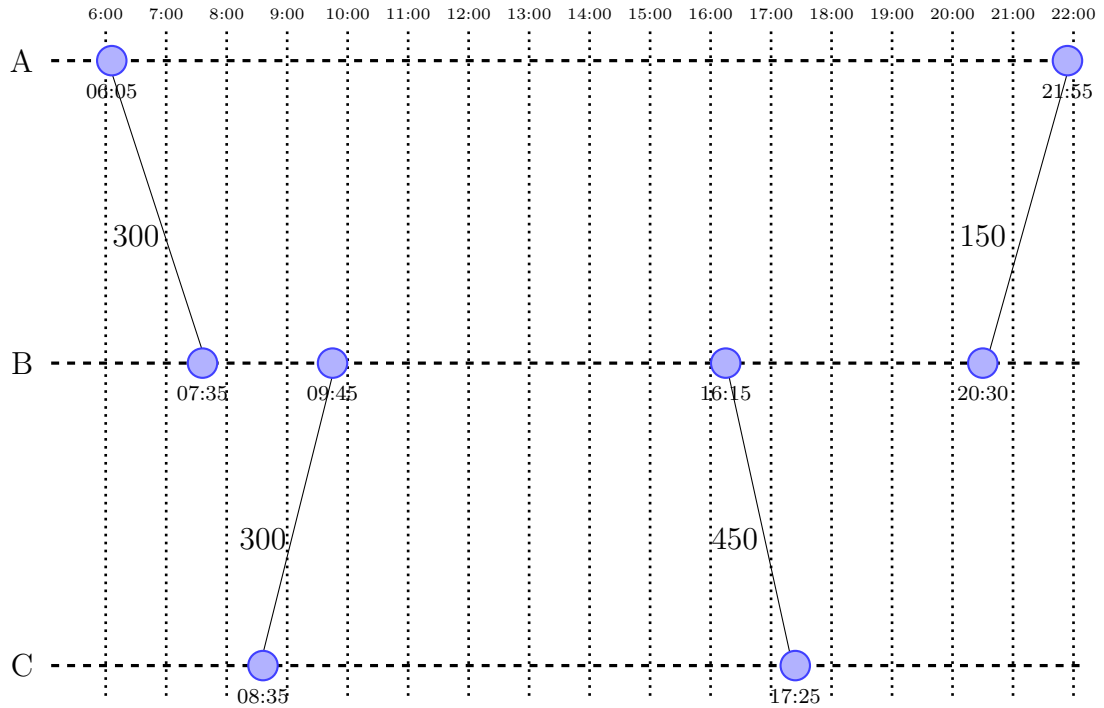


```

\begin{tikzpicture}[scale=0.6]
\tikzstyle{every node}=[
  minimum width=3cm,
  align=center,
]
\tikzstyle{ellipse node}=[
  draw, ellipse, text width=2.2cm, align=center
]
\tikzstyle{rect node}=[
  draw, rectangle, text width=2.2cm, align=center
]
\node (U) [ellipse node] {Utilities};
\node (LC) [ellipse node, above left = 1cm of U] {Latent classes};
\node (EV) [rect node, above = 2cm of U] {Explanatory variables};
\node (C) [rect node, below = 2cm of U] {Choice};
\node (DLC) [above left = 0.5cm and -0.5cm of LC] {Disturbances};
\node (DU) [above right = 0.5cm and -0.5cm of U] {Disturbances};
\draw[-latex, dotted] (DLC) -- (LC.north west);
\draw[-latex, dotted] (DU) -- (U.north east);
\draw[-latex] (EV.south west) -- (LC.north east);
\draw[-latex] (EV.south) -- (U.north);
\draw[-latex] (LC.south east) -- (U.north west);
\draw[-latex, dashed] (U.south) -- (C.north);
\draw [
  very thick,
  decorate,
  decoration={brace, amplitude=10pt, raise=2.5pt},
] (C.south east) -- (C.south west)
node [midway, below=0.5cm] {\bf Class specific \ \ \bf Choice Model};
\draw [
  very thick,
  decorate,
  decoration={brace, amplitude=10pt, raise=2.5pt},
] (LC.south -| DLC.west) -- (EV.north -| DLC.west)
node [midway, left=0.5cm] {\bf Class \ \ \bf Membership \ \ \bf Model};
\end{tikzpicture}

```

Figure 27: graph-27.tex: Diagram with curly braces and node styles



```

\begin{tikzpicture}[scale=.08]
\tikzstyle{mynode}=[circle, thick, draw=blue!75, fill=blue!30,
  minimum size=3mm]
\foreach \t in {6, 7, ..., 22} {
  \draw[line width=1pt, dotted] ({10*\t-5}), 0) -- ({10*\t-5}), 110)
    node[above, font=\tiny] {\t:00};
}
\draw[line width=1.2pt, dashed] (171, 105) -- (0, 105) node[left, font=\normalsize] {A};
\draw[line width=1.2pt, dashed] (171, 55) -- (0, 55) node[left, font=\normalsize] {B};
\draw[line width=1.2pt, dashed] (171, 5) -- (0, 5) node[left, font=\normalsize] {C};
\draw[-] (11, 103) -- (26, 57);
\draw[-] (155, 53) -- (169, 103);
\draw[-] (113, 53) -- (124, 3);
\draw[-] (36, 7) -- (47.5, 53);
\node[mynode] (A-06:05) at (11, 105) {};
\node[font=\normalsize] at (15, 76) {300};
\node[font=\scriptsize] at (11, 100) {06:05};
\node[mynode] (B-07:35) at (26, 55) {};
\node[font=\scriptsize] at (26, 50) {07:35};
\node[mynode] (C-08:35) at (36, 5) {};
\node[font=\normalsize] at (36, 26) {300};
\node[font=\scriptsize] at (36, 0) {08:35};
\node[mynode] (B-09:45) at (47.5, 55) {};
\node[font=\scriptsize] at (47.5, 50) {09:45};
\node[mynode] (B-16:15) at (112.5, 55) {};
\node[font=\normalsize] at (114, 26) {450};
\node[font=\scriptsize] at (112.5, 50) {16:15};
\node[mynode] (C-17:25) at (124, 5) {};
\node[font=\scriptsize] at (124, 0) {17:25};
\node[mynode] (B-20:30) at (155, 55) {};
\node[font=\normalsize] at (155, 76) {150};
\node[font=\scriptsize] at (155, 50) {20:30};
\node[mynode] (A-21:55) at (169, 105) {};
\node[font=\scriptsize] at (169, 100) {21:55};
\end{tikzpicture}

```

Figure 28: graph-28.tex: Schedule

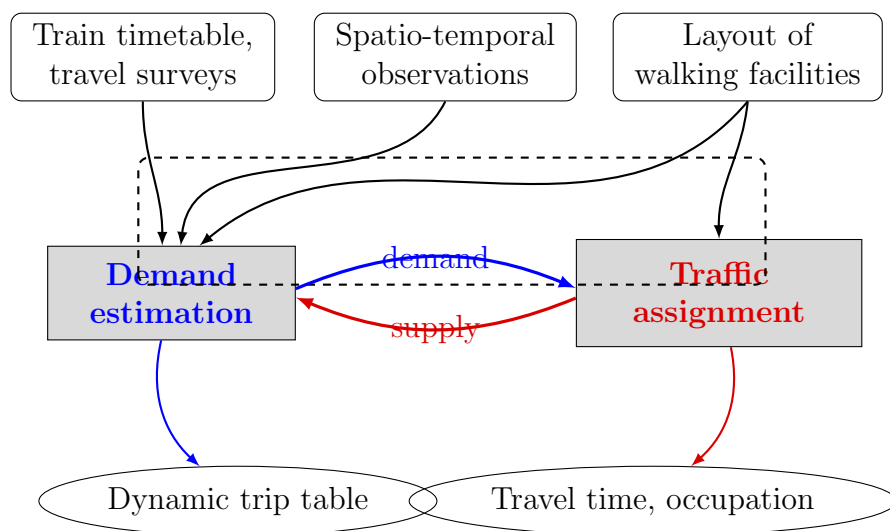


Figure 29: graph-29.tex: Complex flow chart