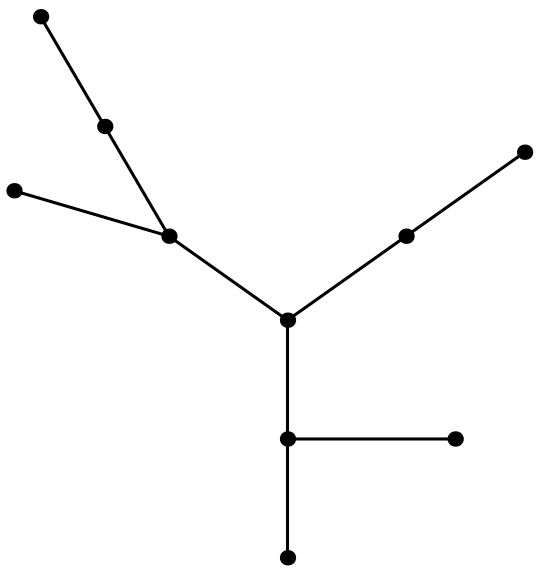
```
g = RandomTree[10]
```

```
-Graph:<9, 10, Undirected>-
```

```
ShowGraph[g]
```



```
- Graphics -
```

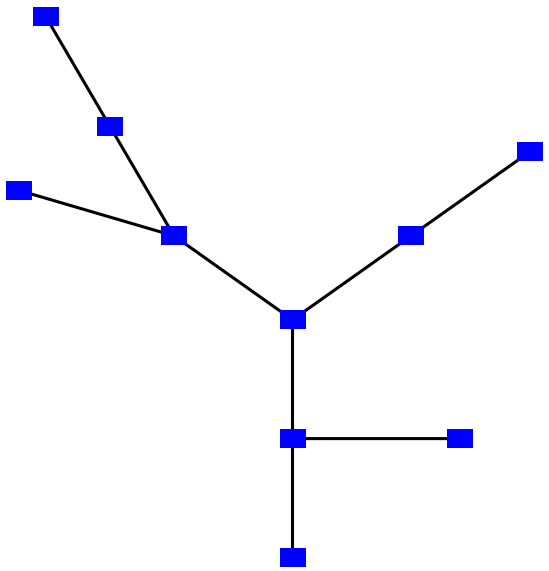
■ Testing Vertex Options

The option VertexStyle can take on values of the form

Shape[Size]

where Shape can be Disk or Box and Size can be Normal, Large, or Small. In addition, Size can be any real number and that will be treated as the diameter of the shape.
The default for VertexStyle is Disk[Normal].

```
ShowGraph[g, VertexColor → Blue, VertexStyle → Box[Normal]]
```



- Graphics -

```
?VertexColor
```

VertexColor is an option that allows the user to associate colors
with vertices. Black is the default color. VertexColor can be set as part
of the graph data structure and it can be used in ShowGraph. Help Browser

```
?VertexStyle
```

VertexStyle is an option that allows the user to associate different sizes
and shapes to vertices. A disk is the default shape. VertexStyle can be set as
part of the graph data structure and it can be used in ShowGraph. Help Browser

```
?Box
```

Box is a value that the option VertexStyle, used in ShowGraph, can be set to. Help Browser

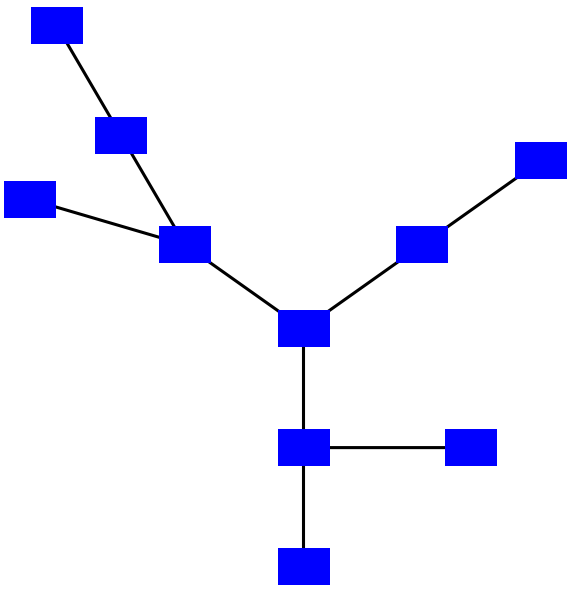
```
?Disk
```

Disk[{x, y}, r] is a two-dimensional graphics primitive that represents a filled disk of radius
r centered at the point x, y. Disk[{x, y}, {rx, ry}] yields an elliptical disk with semi-
axes rx and ry. Disk[{x, y}, r, {theta1, theta2}] represents a segment of a disk.
Disk is also a value that the VertexStyle option in ShowGraph can take. Help Browser

```
?Normal
```

Normal is a value that options VertexStyle, EdgeStyle, and PlotRange can take on in ShowGraph.
Help Browser

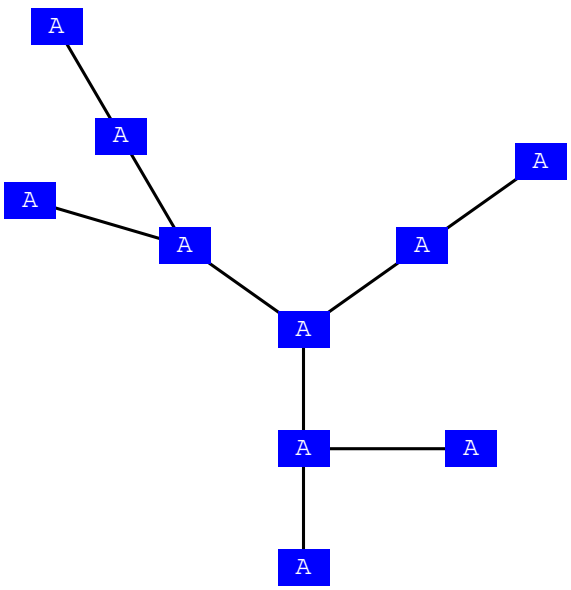
```
ShowGraph[g, VertexColor → Blue, VertexStyle → Box[0.05]]
```



```
- Graphics -
```

The option VertexLabel can be anything. The value "Off" is used to represent no label and this is the default. Any other value is treated as a label and will be displayed. VertexLabelPosition can take on values LowerLeft, LowerRight, UpperLeft, UpperRight, and Center. In addition, VertexLabelPosition can take on a value {x, y}, where {x, y} is treated as the offset of the label from the vertex.

```
ShowGraph[g, VertexColor → Blue, VertexStyle → Box[0.05],
 VertexLabel → "A", VertexLabelColor → White, VertexLabelPosition → Center]
```




```
- Graphics -
```

? VertexLabel

VertexLabel is an option that allows the user to set and display
vertex labels. By default, there are no vertex labels. VertexLabel can
be set as part of the graph data structure or in ShowGraph. Help Browser

? VertexLabelColor

VertexLabelColor is an option that allows the user to associate different
colors to vertex labels. Black is the default color. VertexLabelColor can
be set as part of the graph data structure or in ShowGraph. Help Browser

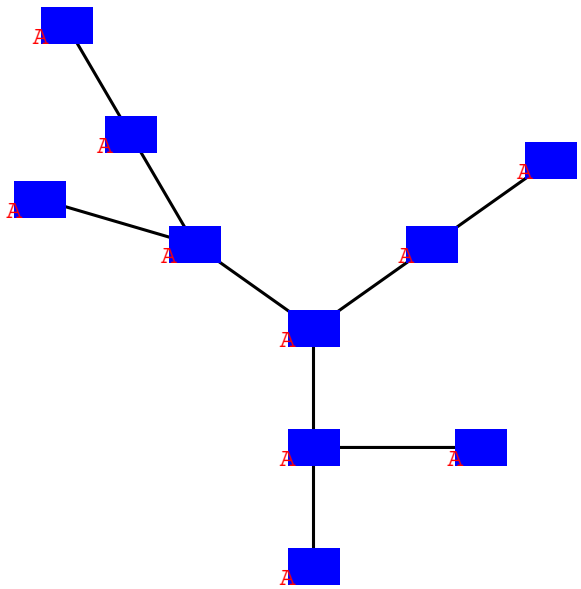
? VertexLabelPosition

VertexLabelPosition is an option that allows the user to place a vertex label in a certain
position relative to the vertex. The default position is upper right. VertexLabelPosition
can be set as part of the graph data structure or in ShowGraph. Help Browser

? Center

Center is a value that options VertexNumberPosition,
VertexLabelPosition, and EdgeLabelPosition can take on in ShowGraph. Help Browser

```
ShowGraph[g, VertexColor → Blue, VertexStyle → Box[0.05],
 VertexLabel → "A", VertexLabelColor → Red, VertexLabelPosition → LowerLeft]
```



- Graphics **-**

? LowerLeft

LowerLeft is a value that options VertexNumberPosition,
VertexLabelPosition, and EdgeLabelPosition can take on in ShowGraph. Help Browser

? LowerRight

LowerRight is a value that options VertexNumberPosition,
VertexLabelPosition, and EdgeLabelPosition can take on in ShowGraph. Help Browser

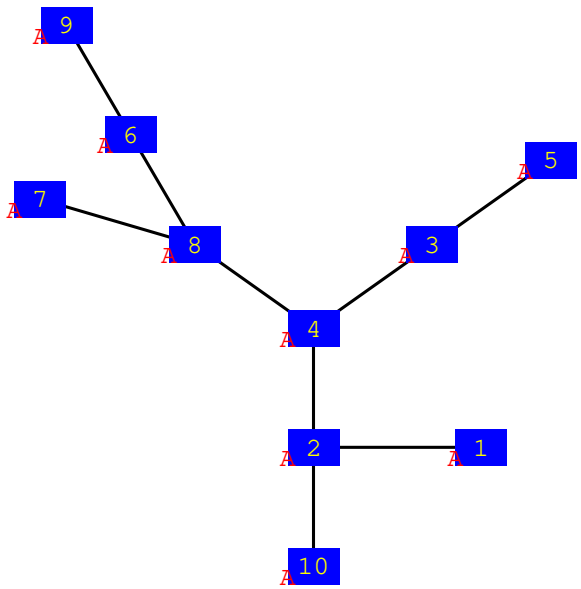
? UpperLeft

UpperLeft is a value that options VertexNumberPosition,
VertexLabelPosition, and EdgeLabelPosition can take on in ShowGraph. Help Browser

```
? UpperRight
```

```
UpperRight is a value that options VertexNumberPosition,
   VertexLabelPosition, and EdgeLabelPosition can take on in ShowGraph. Help Browser
```

```
ShowGraph[g, VertexColor → Blue, VertexStyle → Box[0.05],
 VertexLabel → "A", VertexLabelColor → Red, VertexLabelPosition → LowerLeft,
 VertexNumber → On, VertexNumberPosition → Center, VertexNumberColor → Yellow]
```




```
- Graphics -
```

```
? On
```

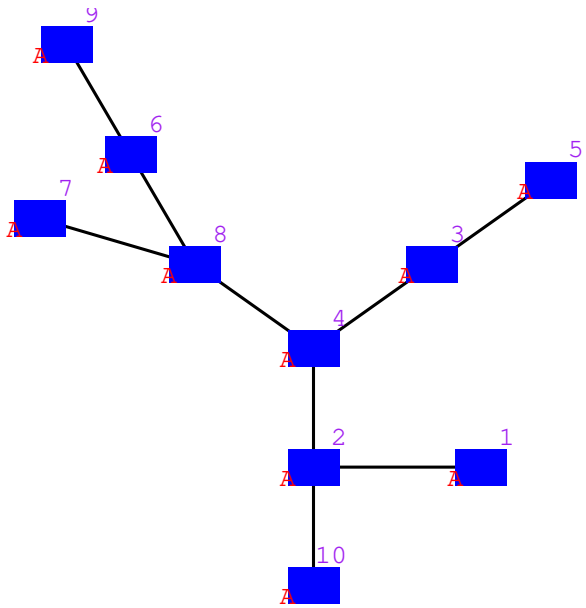
```
On is a value that the options VertexNumber and EdgeDirection
   can take on in the graph data structure or in ShowGraph. Help Browser
```

```
? Off
```

```
Off is a value that the options VertexNumber, VertexLabel, and EdgeDirection
   can take on in the graph data structure or in ShowGraph. Help Browser
```

The example below shows all 8 vertex options.

```
ShowGraph[g, VertexColor → Blue, VertexStyle → Box[0.05], VertexLabel → "A",
 VertexLabelColor → Red, VertexLabelPosition → LowerLeft, VertexNumber → On,
 VertexNumberPosition → {0.05, 0.05}, VertexNumberColor → Purple]
```



- Graphics -

```
?VertexNumber
```

VertexNumber is an option that can be used in ShowGraph to display or
suppress vertex numbers. By default, the vertex numbers are hidden.VertexNumber
can be set as part of the graph data structure or in ShowGraph. Help Browser

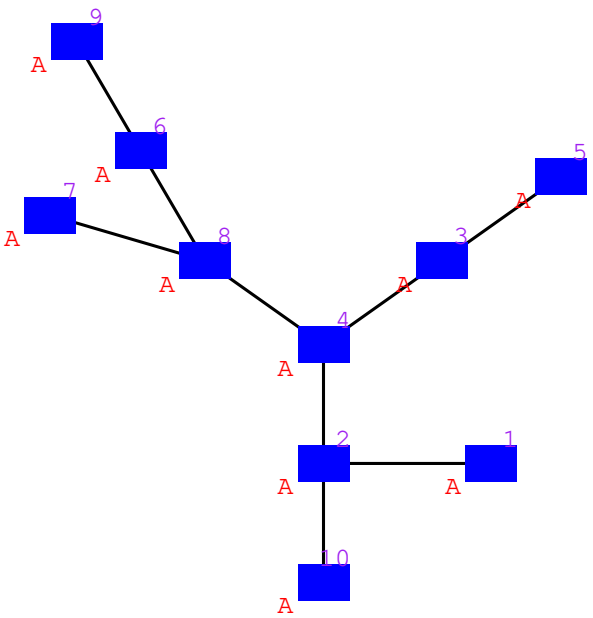
```
?VertexNumberPosition
```

VertexNumberPosition is an option that can be used in ShowGraph to display a
vertex number in a certain position relative to the vertex. By default, vertex
numbers are positioned to the lower left of vertices.VertexNumberPosition
can be set as part of the graph data structure or in ShowGraph. Help Browser

```
?VertexNumberColor
```

VertexNumberColor is an option that can be used in ShowGraph to associate
different colors to vertex numbers. Black is the default color. VertexNumberColor
can be ser as part of the graph data structure or in ShowGraph. Help Browser

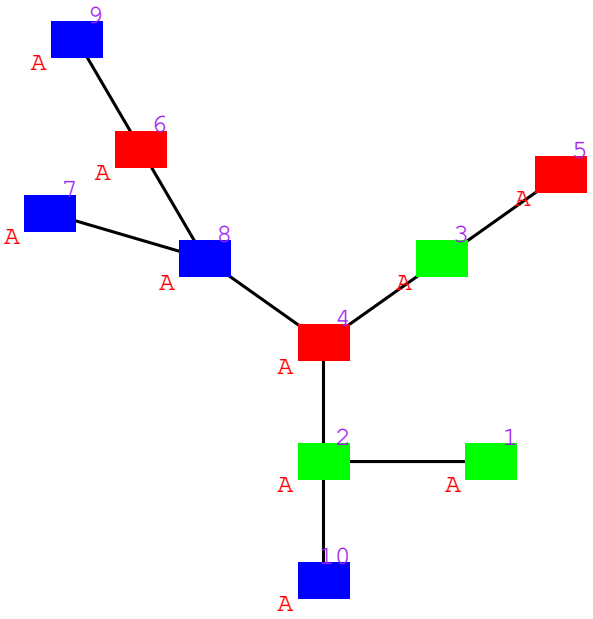
```
ShowGraph[g, VertexColor → Blue, VertexStyle → Box[0.05], VertexLabel → "A",
 VertexLabelColor → Red, VertexLabelPosition → {-0.04, -0.04}, VertexNumber → On,
 VertexNumberPosition → {0.04, 0.04}, VertexNumberColor → Purple]
```




```
- Graphics -
```

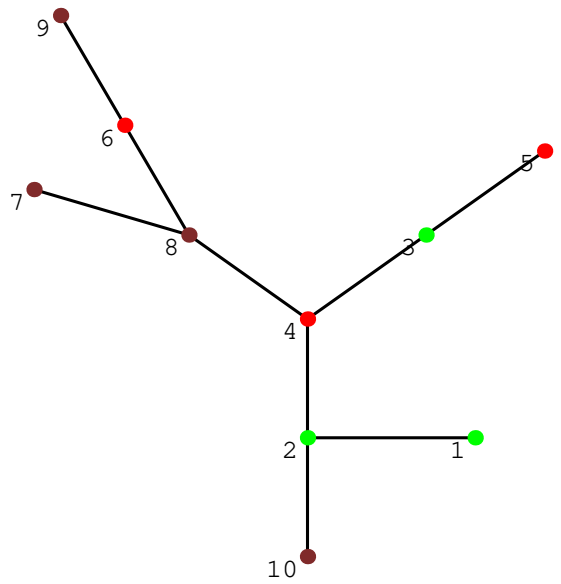
Here options are also set locally. Vertices 1, 2, and 3 are colored Green, 4, 5,and 6 are colored Red, etc.

```
ShowGraph[g, {{1, 2, 3, VertexColor → Green}, {4, 5, 6, VertexColor → Red}},
 VertexColor → Blue, VertexStyle → Box[0.05], VertexLabel → "A",
 VertexLabelColor → Red, VertexLabelPosition → {-0.04, -0.04}, VertexNumber → On,
 VertexNumberPosition → {0.04, 0.04}, VertexNumberColor → Purple]
```




```
- Graphics -
```

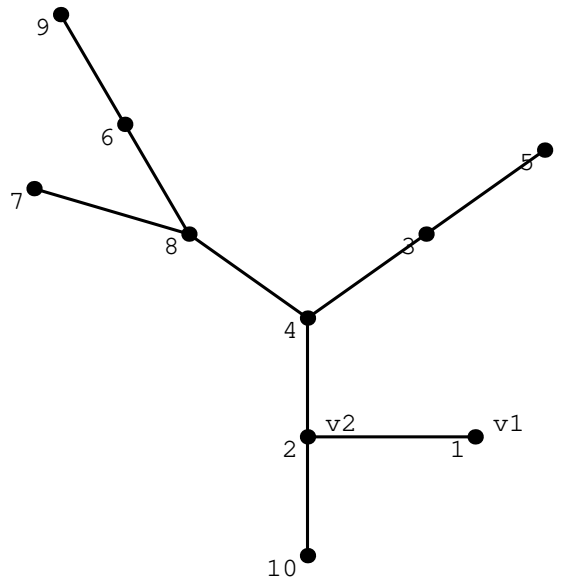
```
ShowGraph[g, {{1, 2, 3, VertexColor → Green}, {4, 5, 6, VertexColor → Red},
  {7, 8, 9, 10, VertexColor → Brown}}, VertexNumber → On ]
```




```
- Graphics -
```

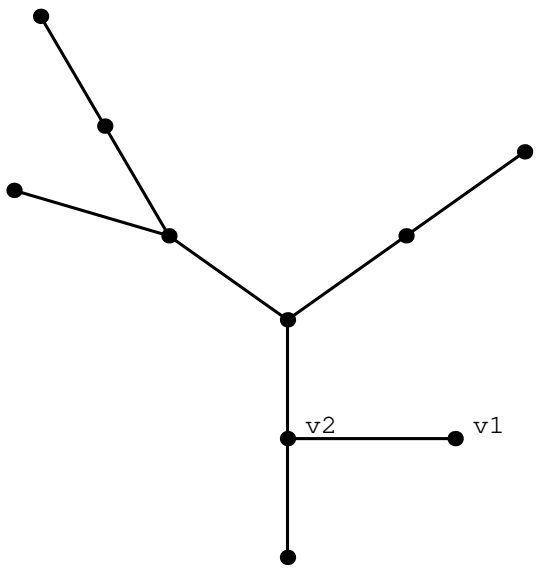
Label "v3" is missing below because it falls outside plot range.

```
ShowGraph[g, {{1, VertexLabel → "v1"},
  {2, VertexLabel → "v2"}, {VertexLabel → "v3"}}, VertexNumber → On ]
```




```
- Graphics -
```

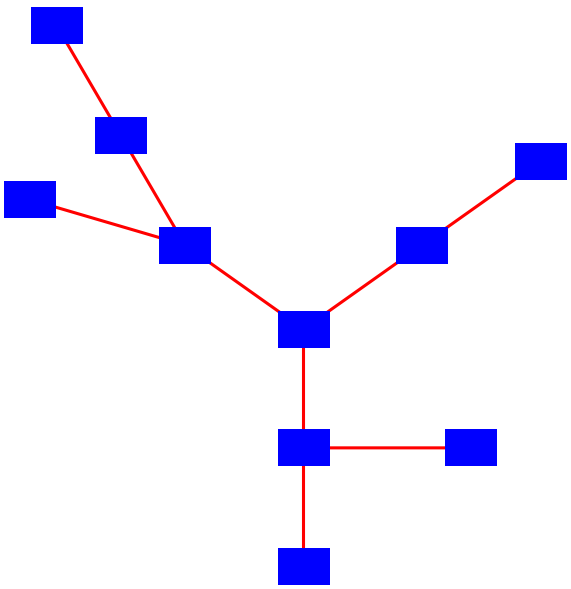
```
ShowGraph[g, {{1, VertexLabel → "v1"}, {2, VertexLabel → "v2"}, {VertexLabel → "v3"}}]
```



- Graphics -

■ Testing Edge Options

```
ShowGraph[g, VertexColor → Blue, EdgeColor → Red, VertexStyle → Box[0.05]]
```

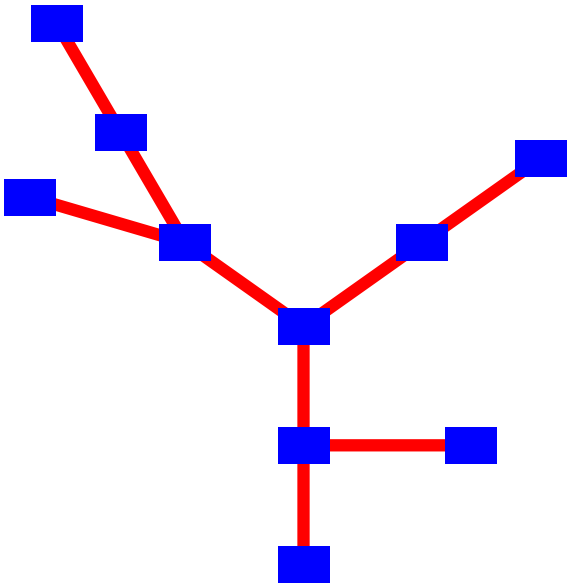


- Graphics -

```
? EdgeColor
```

```
EdgeColor is an option that allows the user to associate
   colors with edges. Black is the default color. EdgeColor can be set
   as part of the graph data structure or in ShowGraph. Help Browser
```

```
ShowGraph[g, VertexColor → Blue,
 EdgeColor → Red, EdgeStyle → Thick, VertexStyle → Box[0.05]]
```



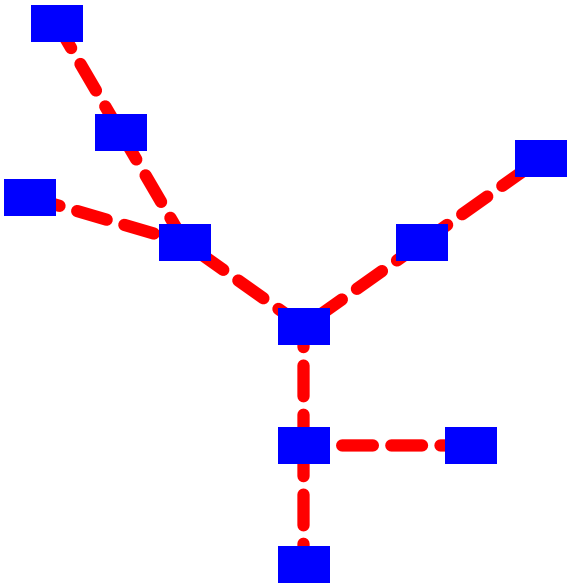
```
- Graphics -
```

```
? EdgeStyle
```

```
EdgeStyle is a an option that allows the user to associate different
   sizes and shapes to edges. A line segment is the default edge. EdgeStyle can
   be set as part of the graph data structure or in ShowGraph. Help Browser
```

The option EdgeStyle can take on the values Thick, Normal, Thin, ThickDashed, NormalDashed, and ThinDashed.

```
ShowGraph[g, VertexColor → Blue, EdgeColor → Red,
 EdgeStyle → ThickDashed, VertexStyle → Box[0.05]]
```



- Graphics -

```
? Thick
```

Thick is a value that the option EdgeStyle can
take on in the graph data structure or in ShowGraph. Help Browser

```
? Thin
```

Thin is a value that the option EdgeStyle can
take on in the graph data structure or in ShowGraph. Help Browser

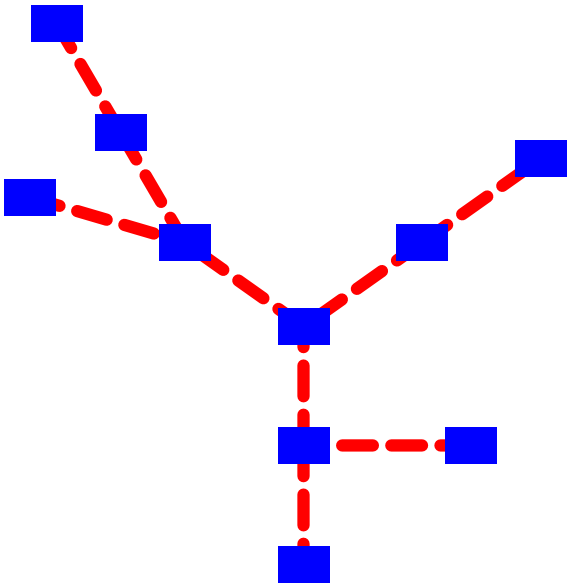
```
? ThickDashed
```

ThickDashed is a value that the option EdgeStyle
can take on in the graph data structure or in ShowGraph. Help Browser

```
? ThinDashed
```

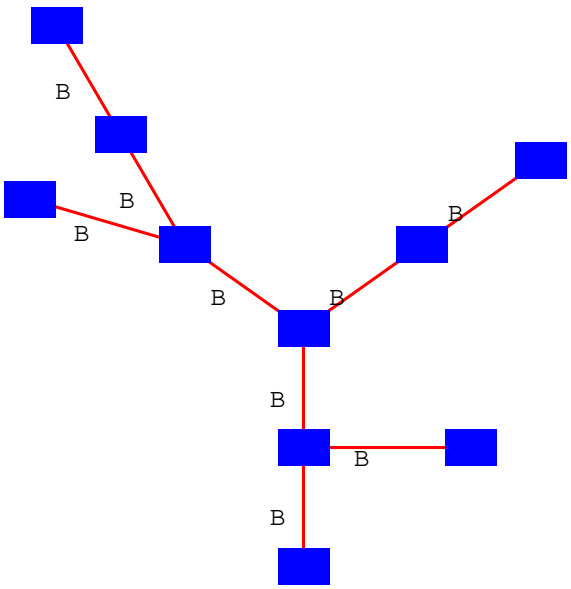
ThinDashed is a value that the option EdgeStyle
can take on in the graph data structure or in ShowGraph. Help Browser

```
ShowGraph[g, {{{1, 9}, {4, 9}, EdgeColor → Black}}, VertexColor → Blue,
 EdgeColor → Red, EdgeStyle → ThickDashed, VertexStyle → Box[0.05]]
```



- Graphics -

```
ShowGraph[g, VertexColor → Blue,
 EdgeColor → Red, VertexStyle → Box[0.05], EdgeLabel → "B"]
```



- Graphics -

```
? EdgeLabel
```

```
EdgeLabel is an option that allows the user to associate labels
   to edges. By default, there are no edge labels. The EdgeLabel option can
   be set as part of the graph data structure or in ShowGraph. Help Browser
```

```
?EdgeLabelPosition
```

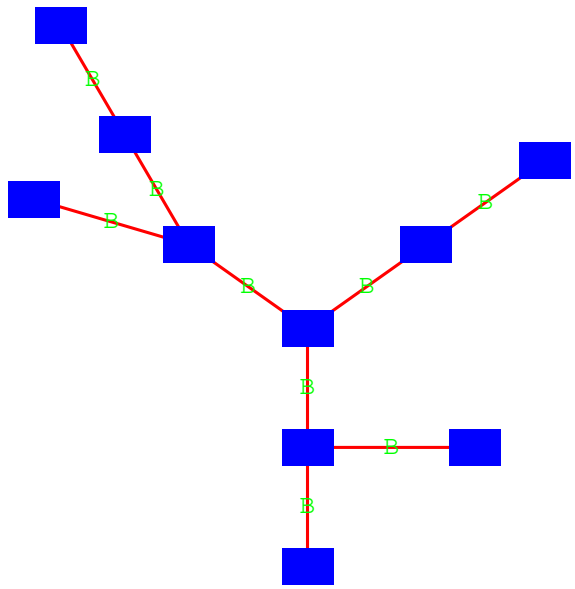
```
EdgeLabelPosition is an option that allows the user to place
   an edge label in a certain position relative to the midpoint of the edge.
   LowerLeft is the default value of this option. EdgeLabelPosition can be
   set as part of the graph data structure or in ShowGraph. Help Browser
```

```
?EdgeLabelColor
```

```
EdgeLabelColor is an option that allows the user to associate
   different colors to edge labels. Black is the default color. EdgeLabelColor
   can be set as part of the graph data structure or in ShowGraph. Help Browser
```

The option EdgeLabel is like the option VertexLabel. The option EdgeLabelPosition takes on the same values as the option VertexLabelPosition. The edge label is positioned ralative to the midpoint of the edge. The dafault for EdgeLabelPosition is LowerLeft.

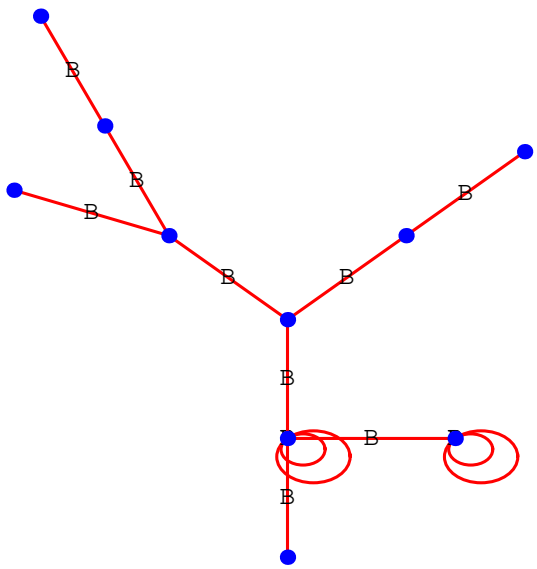
```
ShowGraph[g, VertexColor → Blue, EdgeColor → Red, VertexStyle → Box[0.05],
 EdgeLabel → "B", EdgeLabelColor → Green, EdgeLabelPosition → Center]
```




```
- Graphics -
```

Self−loopsare shown as circles passing through vertices. This example, shows that the bad positioning of edge labels of self−loops. This might be fixed in the future. This example also shows that multiple self−loopsthrough the same vertex are handled reasonably. The option LoopPosition can take the values LowerRight, LowerLeft, UpperRight, and UpperLeft.

```
ShowGraph[AddEdges[g, {{1, 1}, {1, 1}, {2, 2}, {2, 2}}], VertexColor → Blue,
 EdgeColor → Red,  EdgeLabel → "B", EdgeLabelPosition → Center, LoopPosition → LowerRight]
```



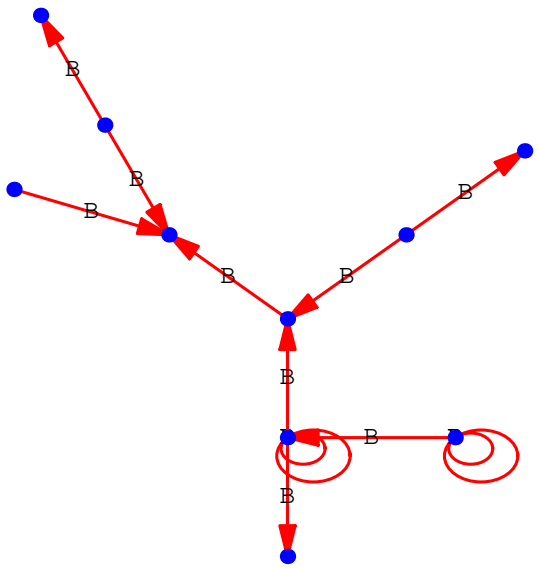

```
- Graphics -
```

```
? LoopPosition
```

```
LoopPosition is an option to ShowGraph whose values tell
   ShowGraph where to position a loop around a vertex. This option can take
   on values UpperLeft, UpperRight, LowerLeft, and LowerRight. Help Browser
```

Even though edge direction is typically set inside the graph data structure, it can be set in ShowGraph via the option EdgeDirection. The loops do not need arrows and so no arrows appear there.

```
ShowGraph[AddEdges[g, {{1, 1}, {1, 1}, {2, 2}, {2, 2}}],
 VertexColor → Blue, EdgeColor → Red, EdgeLabel → "B",
 EdgeLabelPosition → Center, LoopPosition → LowerRight, EdgeDirection → On]
```

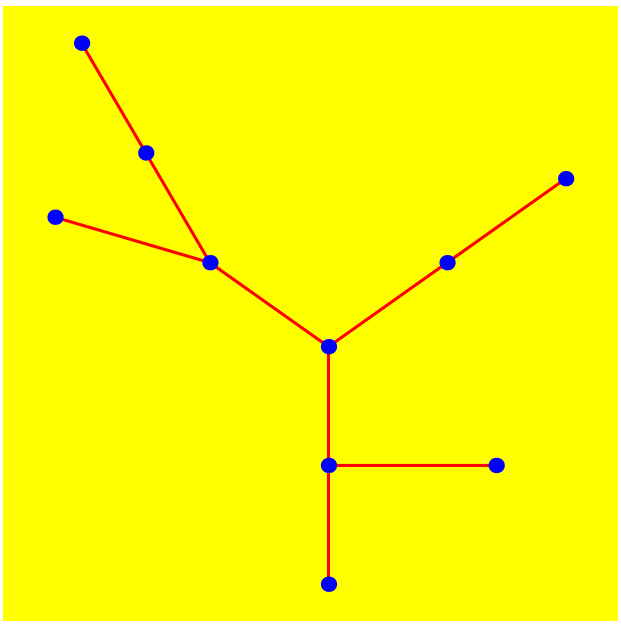


- Graphics -

■ Other Options

All options that can be used in Plot can be used in ShowGraph as well. Similarly, all options that can be used for Arrows can be used in ShowGraph.

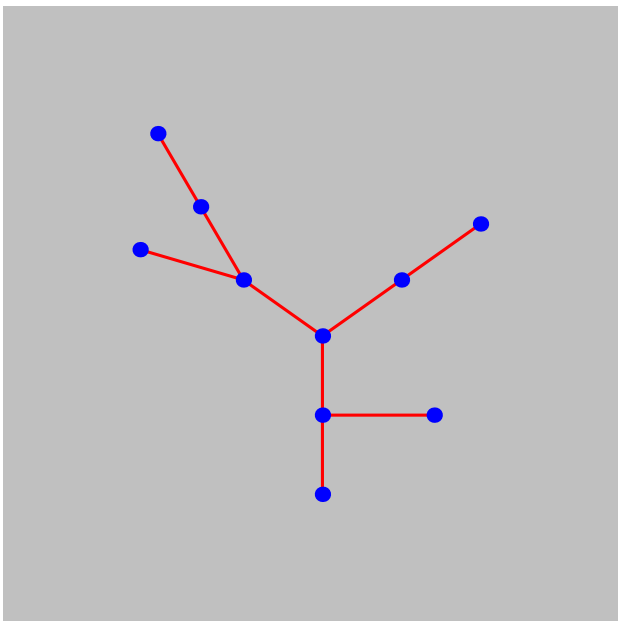
```
ShowGraph[g, VertexColor → Blue, EdgeColor → Red,
 LoopPosition → LowerRight, Background → Yellow]
```



- Graphics -

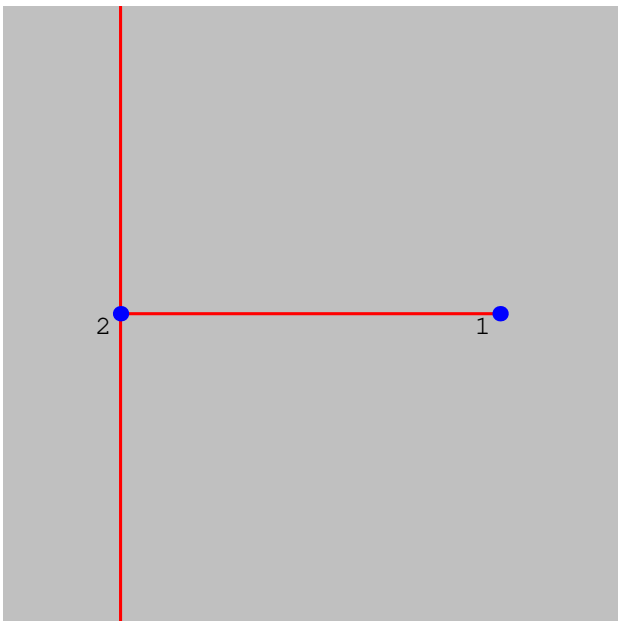
When PlotRange takes on a real value a, a is used as the factor by which the default plot range is expanded. If the default plot range is r, it becomes r(1+a). The default value of PlotRange is Normal and this corresponds to calculating a range in which all the vertices can fit.

```
ShowGraph[g, VertexColor → Blue, EdgeColor → Red,
 LoopPosition → LowerRight, Background → Gray, PlotRange → 0.5]
```



- Graphics -

```
ShowGraph[g, VertexColor → Blue, EdgeColor → Red, LoopPosition → LowerRight,
 Background → Gray, PlotRange → Zoom[{1, 2}], VertexNumber → On]
```



- Graphics -

```
? Zoom
```

```
Zoom[{i, j, k, ...}] is a value that the PlotRange option can
   take on in ShowGraph. Setting PlotRange to this value zooms the display
   on to the specified subset of vertices, i, j, k, .... Help Browser
```

```
? GraphOptions
```

```
GraphOptions[g] returns the display options associated with g. GraphOptions[g, v]
   returns the display options associated with vertex v in g. GraphOptions[g, {u,
   v}] returns the display options associated with edge {u, v} in g Help Browser
```