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About the Tutorial

Scalable Vector Graphics commonly known as SVG is a XML based format to draw vector images. It is used to draw twodimentional vector images.

This tutorial will teach you basics of SVG. Also, this training material contains chapters discussing all the basic components of SVG with suitable examples.

Audience

This tutorial has been prepared for beginners to help them understand the basic concepts related to SVG. Also, it will give you enough understanding on SVG from where you can take yourself to a higher level of expertise.

Prerequisites

Before proceeding with this tutorial, it is advisable to have some basic knowledge of XML, HTML, and JavaScript.

Disclaimer & Copyright

Table of Contents

1. SVG OVERVIEW

What is SVG?

- SVG, Scalable Vector Graphics is an XML based language to define vector based graphics.
- SVG is expected to display images over the web.
- As these are vector images, SVG images never drops on quality no matter how they are zoomed out or resized.
- SVG images supports interactivity and animation.
- SVG is a W3C standard.
- Other image formats like raster images can also be clubbed with SVG images.
- SVG integrates well with XSLT and DOM of HTML.

Advantages

- Use any text editor to create and edit SVG images.
- Being XML based, SVG images are searchable, indexable and can be scripted and compressed.
- SVG images are highly scalable as they never loses quality no matter how they are zoomed out or resized
- Good printing quality at any resolution
- SVG is an Open Standard

Disadvantages

- Since text format size is larger, it is generally compared to binary formatted raster images.
- Size can be big even for a smaller image.

Example

Following XML snippet can be used to draw a circle in web browser.

```
<svg width="100" height="100">
   <circle cx="50" cy="50" r="40" stroke="red" stroke-width="2"
fill="green" />
</svg>
```

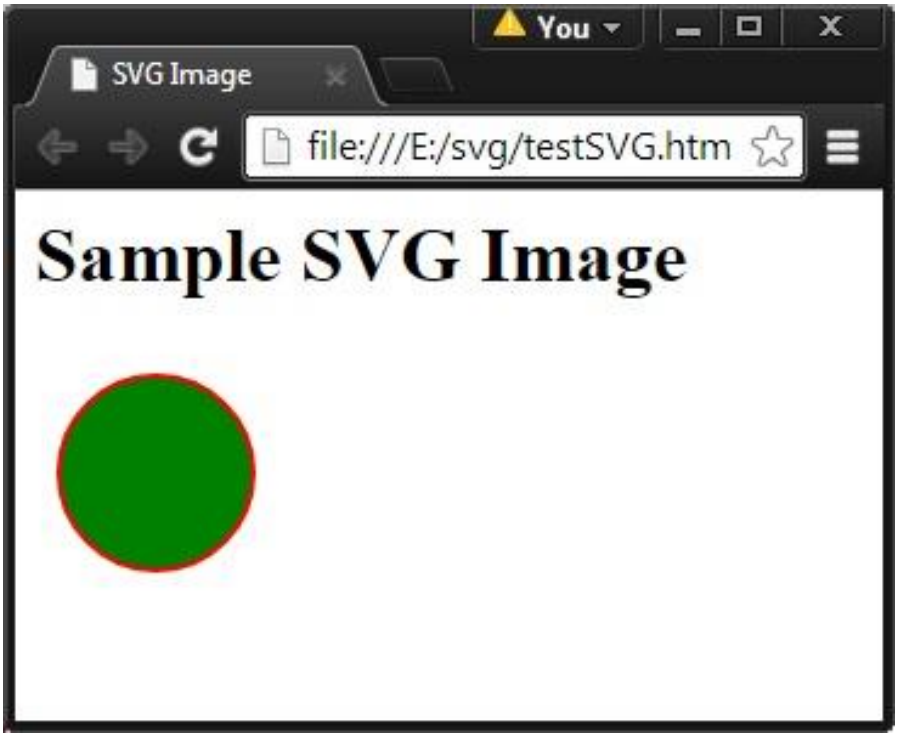
Embed the SVG XML directly in an HTML page.

testSVG.htm

```
<html>
<title>SVG Image</title>
<body>
<h1>Sample SVG Image</h1>
<svg width="100" height="100">
  <circle cx="50" cy="50" r="40" stroke="red" stroke-width="2"
fill="green" />
</svg>
</body>
</html>
```

Output

Open textSVG.htm in Chrome web browser. You can use Chrome/Firefox/Opera to view SVG image directly without any plugin. In Internet Explorer, activeX controls are required to view SVG images.



How SVG Integrates with HTML

- <svg> element indicates the start of SVG image.
- <svg> element's width and height attributes defines the height and width of the SVG image.
- In the above example, we've used a <circle> element to draw a circle.
- **cx** and **cy** attribute represents center of the circle. Default value is (0,0).
- **"r"** attribute represents radius of circle.
- Other attribues stroke and stroke-width controls the outlining of the circle.
- fill attributes defines the fill color of the circle.
- Closing</svg> tag indicates the end of SVG image.

2. SVG SHAPES

SVG provides a number of shapes which can be used to draw images.

Following are the common shapes.

S.No.	Shape Type & Description
1	**Rect**: Used to draw a rectangle.
2	**Circle**: Used to draw a circle.
3	**Ellipse**: Used to draw a ellipse.
4	**Line**: Used to draw a line.
5	**Polygon**: Used to draw a closed shape consisting of connected straight lines.
6	**Polyline**: Used to draw a open shape consisting of connected straight lines.
7	**Path**: Used to draw any path.

SVG Rect

<**rect**> element is used to draw rectangle which is axis aligned with the current user co-ordinate system.

Declaration

Following is the syntax declaration of **<rect>** element. We've shown main attributes only.

```
<rect
   x="x-axis co-ordinate"
   y="y-axis co-ordinate"
   width="length"
   height="length"
   rx="length"
```

```
   ry="length"
   style="style information"
   class="style class" >
</rect>
```

Attributes

S.No.	Name & Description
1	**x** - x-axis co-ordinate of top left of the rectangle. Default is 0.
2	**y** - y-axis co-ordinate of top left of the rectangle. Default is 0.
3	**width** - width of the rectangle.
4	**height** - height of the rectangle.
5	**rx** - used to round the corner of the rounded rectangle.
6	**ry** - used to round the corner of the rounded rectangle.
7	**style** - used to specify inline styles.
8	**class** - used to specify external style name to the element.

Example

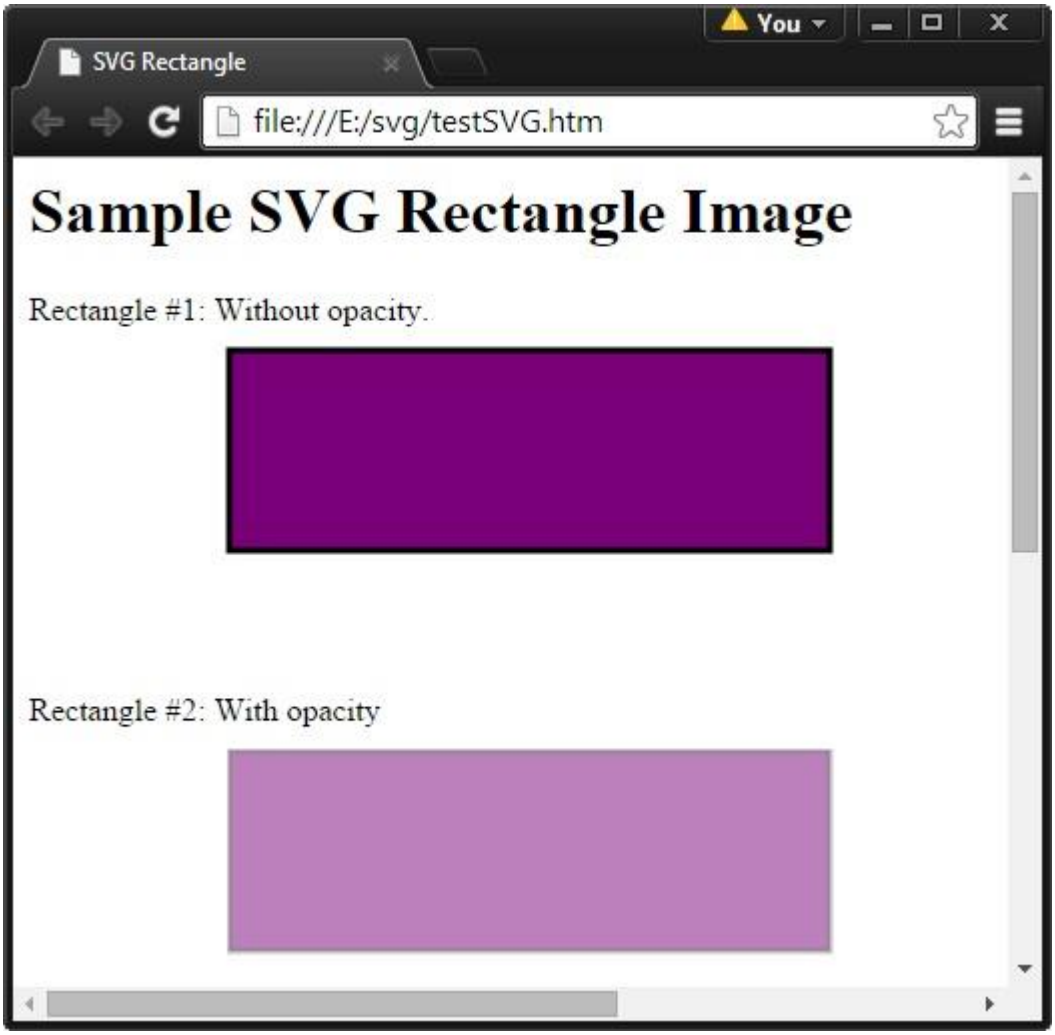
testSVG.htm

```
<html>
<title>SVG Rectangle</title>
<body>
<h1>Sample SVG Rectangle Image</h1>
<svg width="800" height="800">
   <g>
      <text x="0" y="15" fill="black" >
      Rectangle #1: Without opacity.</text>
      <rect x="100" y="30" width="300" height="100"
      style="fill:rgb(121,0,121);stroke-width:3;stroke:rgb(0,0,0)">
```

```
   </g>
   <g>
      <text x="0" y="215" fill="black" >
      Rectangle #2: With opacity </text>
      <rect x="100" y="230" width="300" height="100"
      style="fill:rgb(121,0,121);stroke-width:3;stroke:rgb(0,0,0);
      stroke-opacity:0.5;opacity:0.5">
   </g>
   <g>
      <text x="0" y="415" fill="black" >
      Rectangle #3: With Rounded Corner </text>
      <rect x="100" y="430" rx="10" ry="10" width="300" height="100"
      style="fill:rgb(121,0,121);stroke-width:3;stroke:rgb(0,0,0);">
   </g>
</svg>
</body>
</html>
```

Output

Open textSVG.htm in Chrome web browser. You can use Chrome/Firefox/Opera to view SVG image directly without any plugin. Internet Explorer 9 and higher also supports SVG image rendering.



SVG Circle

<circle> element is used to draw circle with a center point and given radius.

Declaration

Following is the syntax declaration of **<circle>** element. We've shown main attributes only.

```
<circle
   cx="x-axis co-ordinate"
   cy="y-axis co-ordinate"
   r="length" >
</circle>
```

Attributes

S.NO.	Name & Description
1	**cx** - x-axis co-ordinate of the center of the circle. Default is 0.
2	**cy** - y-axis co-ordinate of the center of the circle. Default is 0.
3	**r** - radius of the circle.

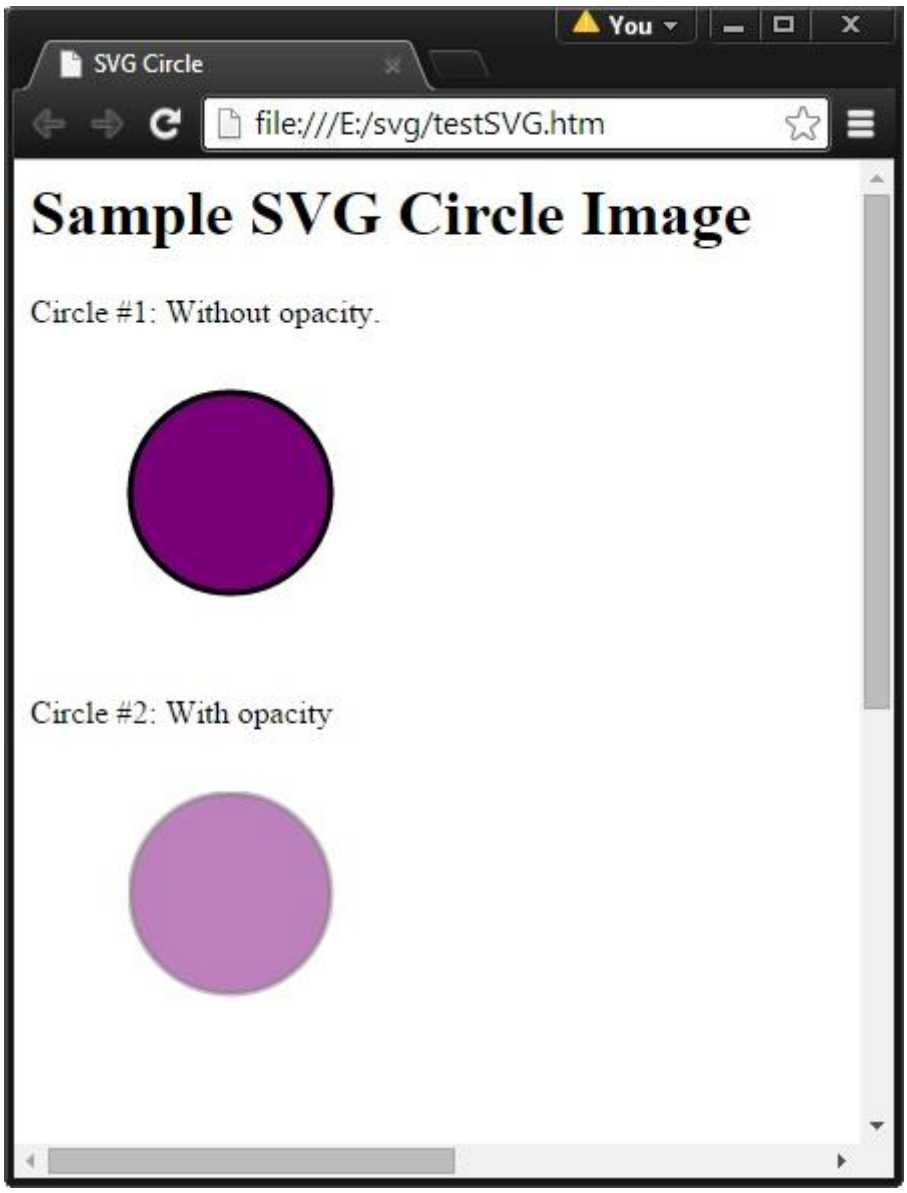
Example

testSVG.htm

```
<html>
<title>SVG Circle</title>
<body>
   <h1>Sample SVG Circle Image</h1>
   <svg width="800" height="800">
      <g>
         <text x="0" y="15" fill="black" >Circle #1: Without
opacity.</text>
         <circle cx="100" cy="100" r="50" stroke="black"
         stroke-width="3" fill="rgb(121,0,121)">
      </g>
      <g>
         <text x="0" y="215" fill="black" >Circle #2: With opacity
</text>
         <circle cx="100" cy="300" r="50"
         style="fill:rgb(121,0,121);stroke-width:3;
         stroke:rgb(0,0,0);stroke-opacity:0.5;opacity:0.5">
      </g>
   </svg>
</body>
</html>
```

Output

Open textSVG.htm in Chrome web browser. You can use Chrome/Firefox/Opera to view SVG image directly without any plugin. Internet Explorer 9 and higher also supports SVG image rendering.



SVG Ellipse

<ellipse> element is used to draw ellipse with a center point and given two radii.

Declaration

Following is the syntax declaration of **<ellipse>** element. We've shown main attributes only.

```
<ellipse
   cx="x-axis co-ordinate"
   cy="y-axis co-ordinate"
   rx="length"
   ry="length" >
</ellipse>
```

Attributes

S.No.	Name & Description
1	**cx** - x-axis co-ordinate of the center of the ellipse. Default is 0.
2	**cy** - y-axis co-ordinate of the center of the ellipse. Default is 0.
3	**rx** - x-axis radius of the ellipse.
4	**rx** - y-axis radius of the ellipse.

Example

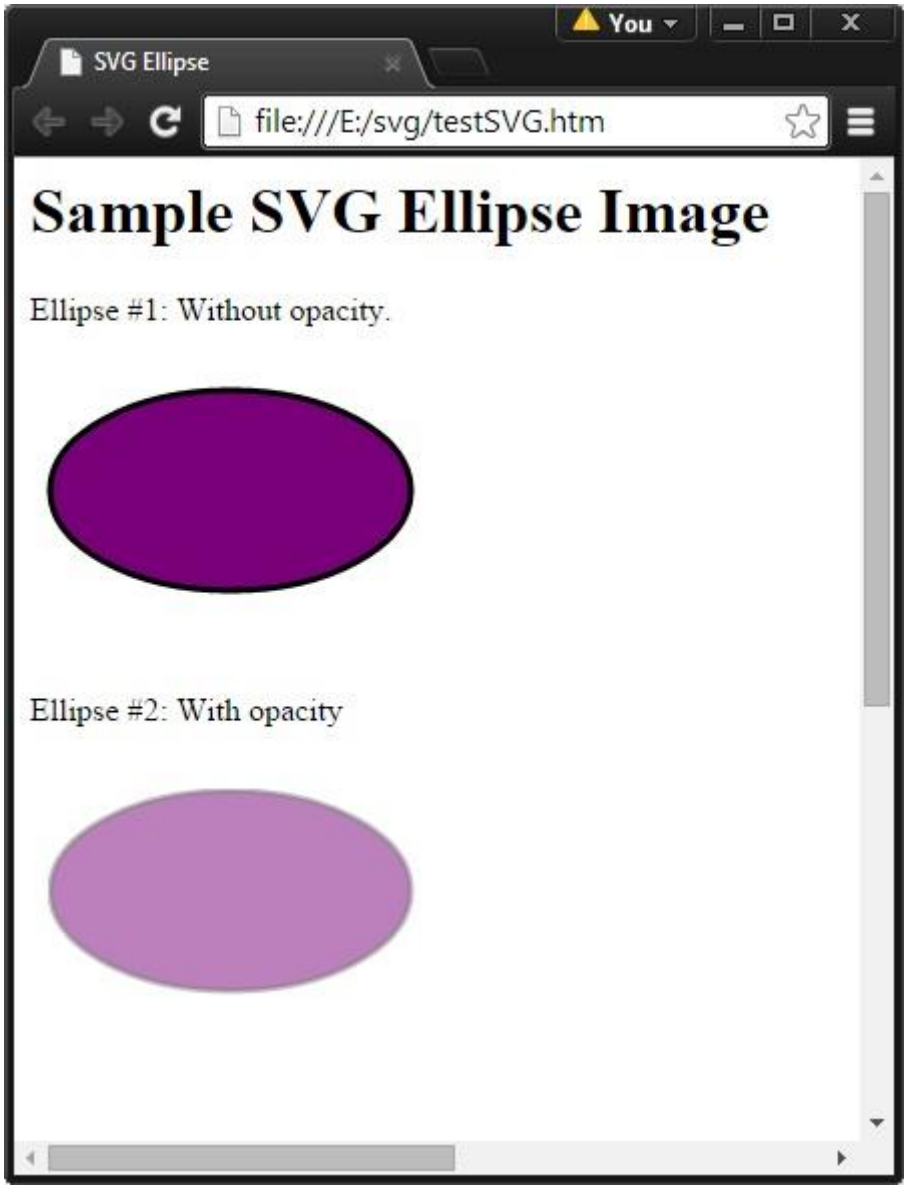
testSVG.htm

```
<html>
<title>SVG Ellipse</title>
<body>
<h1>Sample SVG Ellipse Image</h1>
<svg width="800" height="800">
   <g>
      <text x="0" y="15" fill="black" >Ellipse #1: Without
opacity.</text>
```

```
      <ellipse cx="100" cy="100" rx="90" ry="50"
      Strok
e="black" stroke-width="3" fill="rgb(121,0,121)">
   </g>
   <g>
      <text x="0" y="215" fill="black" >Ellipse #2: With opacity </text>
      <ellipse cx="100" cy="300" rx="90" ry="50"
      style="fill:rgb(121,0,121);stroke-width:3;
      stroke:rgb(0,0,0);stroke-opacity:0.5;opacity:0.5">
   </g>
</svg>
</body>
</html>
```

Output

Open textSVG.htm in Chrome web browser. You can use Chrome/Firefox/Opera to view SVG image directly without any plugin. Internet Explorer 9 and higher also supports SVG image rendering.



SVG Line

<line> element is used to draw line with a start point and end point.

Declaration

Following is the syntax declaration of **<line>** element. We've shown main attributes only.

```
<line
   x1="x-axis co-ordinate"
   y1="y-axis co-ordinate"
   x2="x-axis co-ordinate"
```

```
   y2="y-axis co-ordinate" >
</line>
```

Attributes

S.No.	Name & Description
1	x1 - x-axis co-ordinate of the start point. Default is 0.
2	y1 - y-axis co-ordinate of the start point. Default is 0.
3	x2 - x-axis co-ordinate of the end point. Default is 0.
4	y2 - y-axis co-ordinate of the end point. Default is 0.

Example

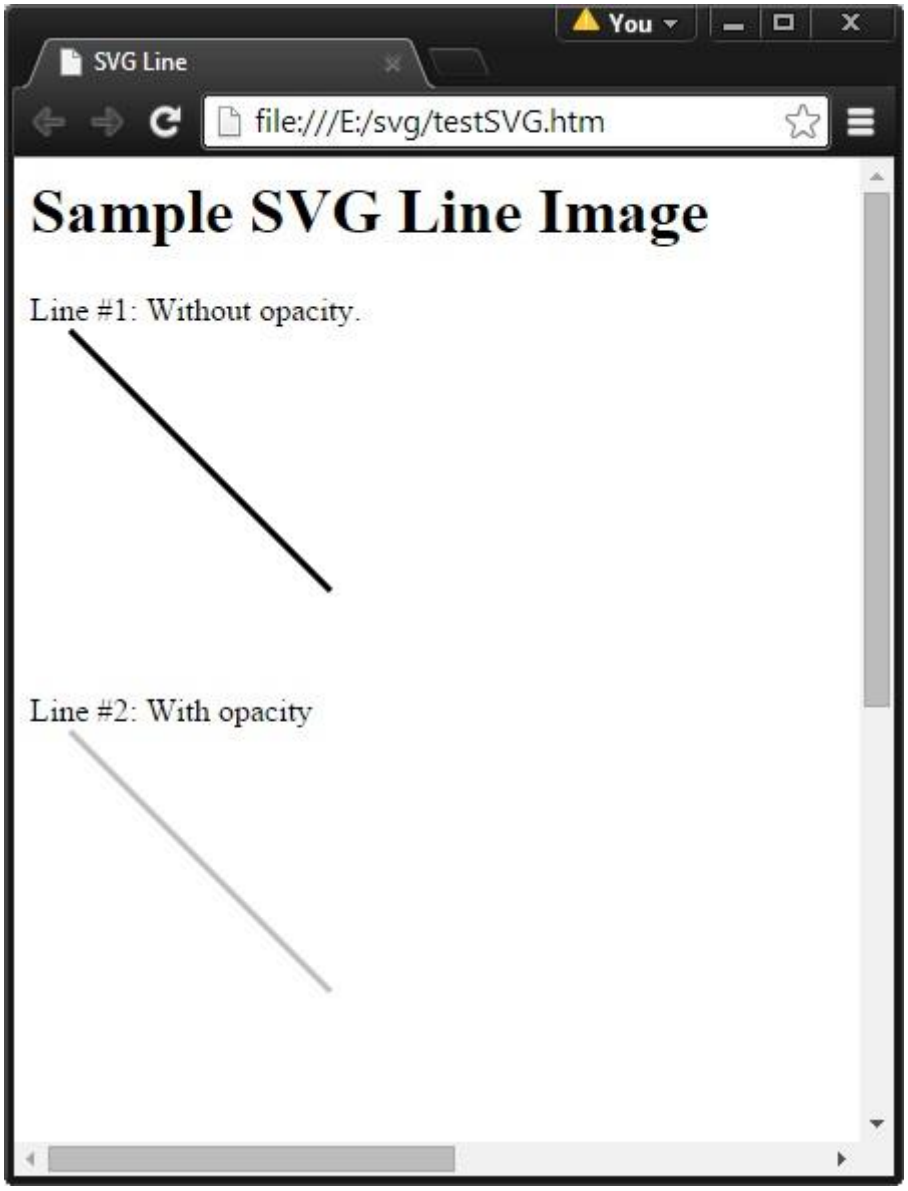
testSVG.htm

```
<html>
<title>SVG Line</title>
<body>
<h1>Sample SVG Line Image</h1>
<svg width="800" height="800">
   <g>
      <text x="0" y="15" fill="black" >Line #1: Without opacity.</text>
      <line x1="20" y1="20" x2="150" y2="150"
      stroke="black" stroke-width="3" fill="rgb(121,0,121)">
   </g>
   <g>
      <text x="0" y="215" fill="black" >Line #2: With opacity </text>
      <line x1="20" y1="220" x2="150" y2="350"
      style="fill:rgb(121,0,121);stroke-width:3;
      stroke:rgb(0,0,0);stroke-opacity:0.5;opacity:0.5">
   </g>
</svg>
</body>
```

```
</html>
```

Output

Open textSVG.htm in Chrome web browser. You can use Chrome/Firefox/Opera to view SVG image directly without any plugin. Internet Explorer 9 and higher also supports SVG image rendering.



SVG Polygon

<polygon> element is used to draw a closed shape consisting of connected straight lines.

Declaration

Following is the syntax declaration of **<polygon>** element. We've shown main attributes only.

```
<polygon
   points="list of points" >
</polygon>
```

Attributes

S.NO.	Name & Description
1	**points** - List of points to make up a polygon.

Example

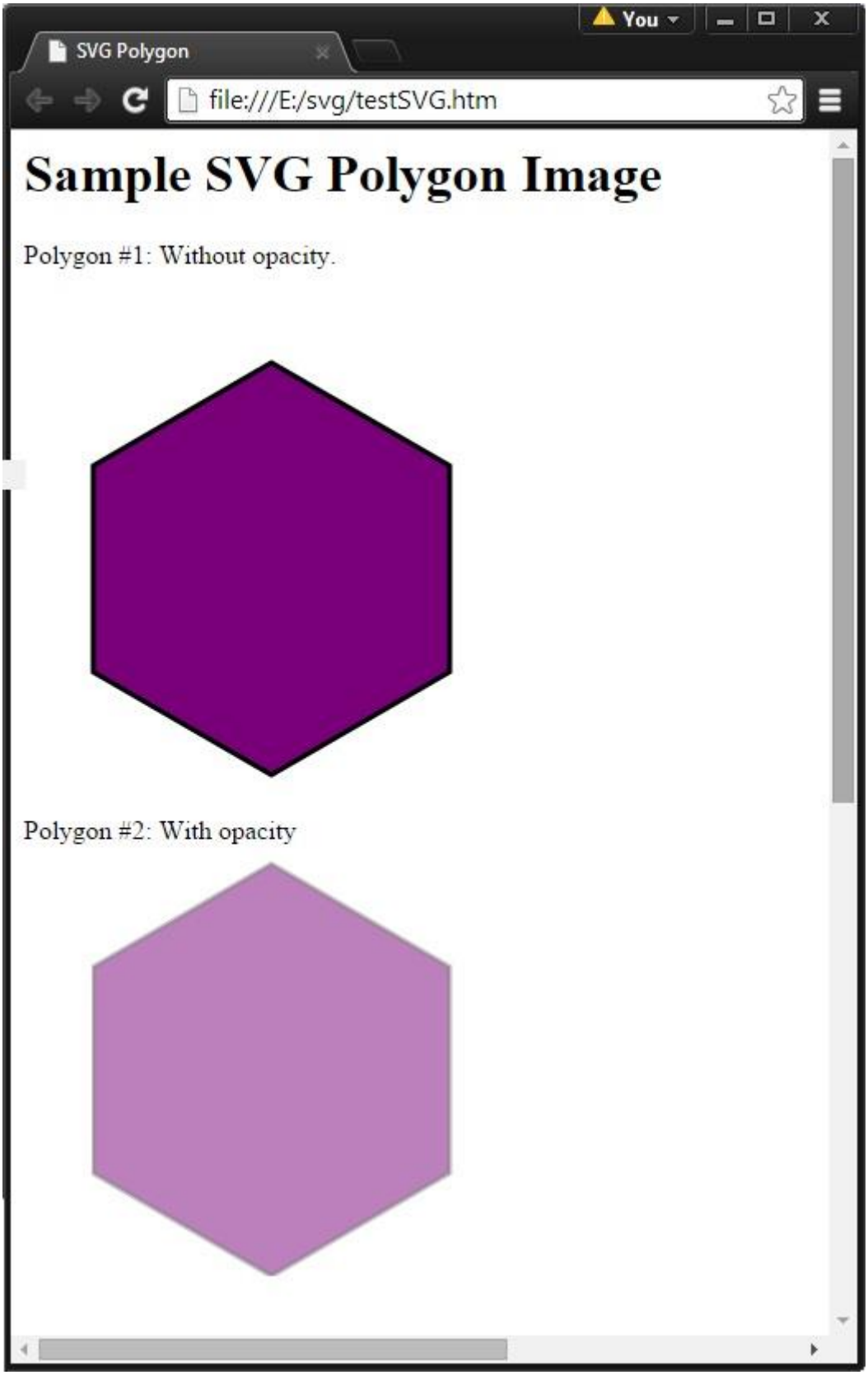
testSVG.htm

```
<html>
<title>SVG Polygon</title>
<body>
<h1>Sample SVG Polygon Image</h1>
<svg width="800" height="800">
   <g>
      <text x="0" y="15" fill="black" >Polygon #1: Without
opacity.</text>
      <polygon points="150,75 258,137.5 258,262.5 150,325 42,262.6
42,137.5"
      stroke="black" stroke-width="3" fill="rgb(121,0,121)">
   </g>
   <g>
      <text x="0" y="360" fill="black" >Polygon #2: With opacity </text>
      <polygon points="150,375 258,437.5 258,562.5 150,625 42,562.6
42,437.5"
      style="fill:rgb(121,0,121);stroke-width:3;
      stroke:rgb(0,0,0);stroke-opacity:0.5;opacity:0.5">
   </g>
```

```
</svg>
</body>
</html>
```

Output

Open textSVG.htm in Chrome web browser. You can use Chrome/Firefox/Opera to view SVG image directly without any plugin. Internet Explorer 9 and higher also supports SVG image rendering.



SVG Polyline

<polyline> element is used to draw a connected straight lines.

Declaration

Following is the syntax declaration of **<polyline>** element. We've shown main attributes only.

```
<polyline
   points="list of points"  >
</polyline>
```

Attributes

S.NO.	Name & Description
1	points - List of points to make up a polyline.

Example

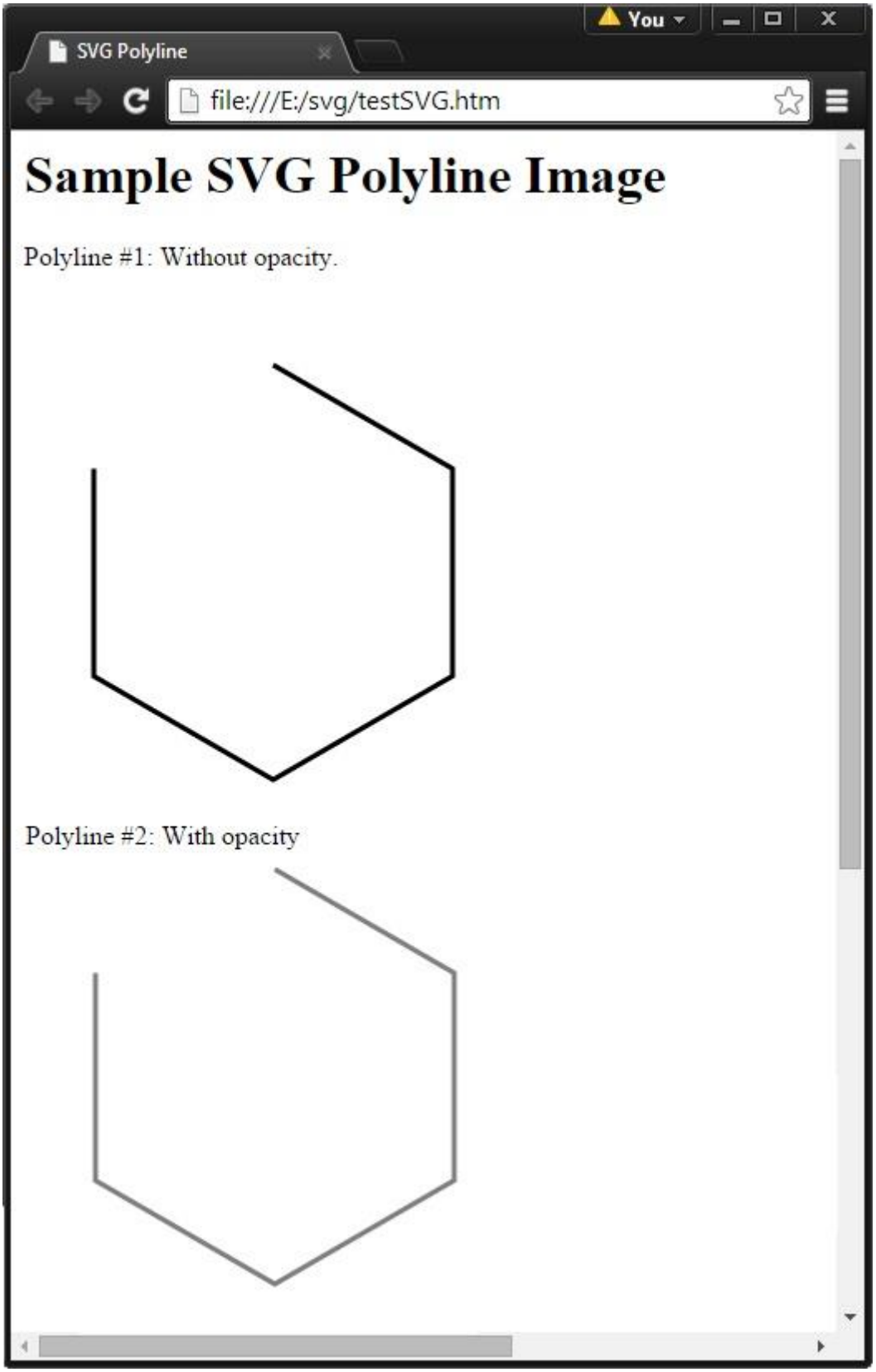
testSVG.htm

```
<html>
<title>SVG Polyline</title>
<body>
<h1>Sample SVG Polyline Image</h1>
<svg width="800" height="800">
   <g>
      <text x="0" y="15" fill="black" >Polyline #1: Without
opacity.</text>
      <polyline points="150,75 258,137.5 258,262.5 150,325 42,262.6
42,137.5"
      stroke="black" stroke-width="3" fill="none">
   </g>
   <g>
      <text x="0" y="360" fill="black" >Polyline #2: With opacity
</text>
      <polyline points="150,375 258,437.5 258,562.5 150,625 42,562.6
42,437.5"
```

```
      style="fill:none;stroke-width:3;
      stroke:rgb(0,0,0);stroke-opacity:0.5;">
   </g>
</svg>
</body>
</html>
```

Output

Open textSVG.htm in Chrome web browser. You can use Chrome/Firefox/Opera to view SVG image directly without any plugin. Internet Explorer 9 and higher also supports SVG image rendering.



SVG Path

<path> element is used to draw a connected straight lines.

Declaration

Following is the syntax declaration of **<path>** element. We've shown main attributes only.

```
<path
   d="data" >
</path>
```

Attributes

S.NO.	Name & Description
1	d - path data,usually a set of commands like moveto, lineto etc.

<path> element is used to define any path. Path element uses Path data which comprises of number of commands. Commands behaves like a nip of pencil or a pointer is moving to draw a path.

S.NO.	Command & Description
1	**M** - moveto - move from one point to another point.
2	**L** - lineto - create a line.
3	**H** - horizontal lineto - create a horizontal line.
4	**V** - vertical lineto - create a vertical line.
5	**C** - curveto - create a curve.

6	**S** - smooth curveto - create a smooth curve.
7	**Q** - quadratic Bezier curve - create a quadratic Bezier curve.
8	**T** - smooth quadratic Bezier curveto - create a smooth quadratic Bezier curve
9	**A** - elliptical Arc - create a elliptical arc.
10	**Z** - closepath - close the path.

As above commands are in Upper case, these represents absolute path. However, if they are in lower case, then relative path is used.

Example

testSVG.htm

```
<html>
<title>SVG Path</title>
<body>
<h1>Sample SVG Path Image</h1>
<svg width="800" height="800">
   <g>
      <text x="0" y="15" fill="black" >Path #1: Without opacity.</text>
      <path d="M 100 100 L 300 100 L 200 300 z"
      stroke="black" stroke-width="3" fill="rgb(121,0,121)">
   </g>
   <g>
      <text x="0" y="360" fill="black" >Path #2: With opacity </text>
      <path d="M 100 500 L 300 500 L 200 700 z"
      style="fill:rgb(121,0,121);stroke-width:3;
```

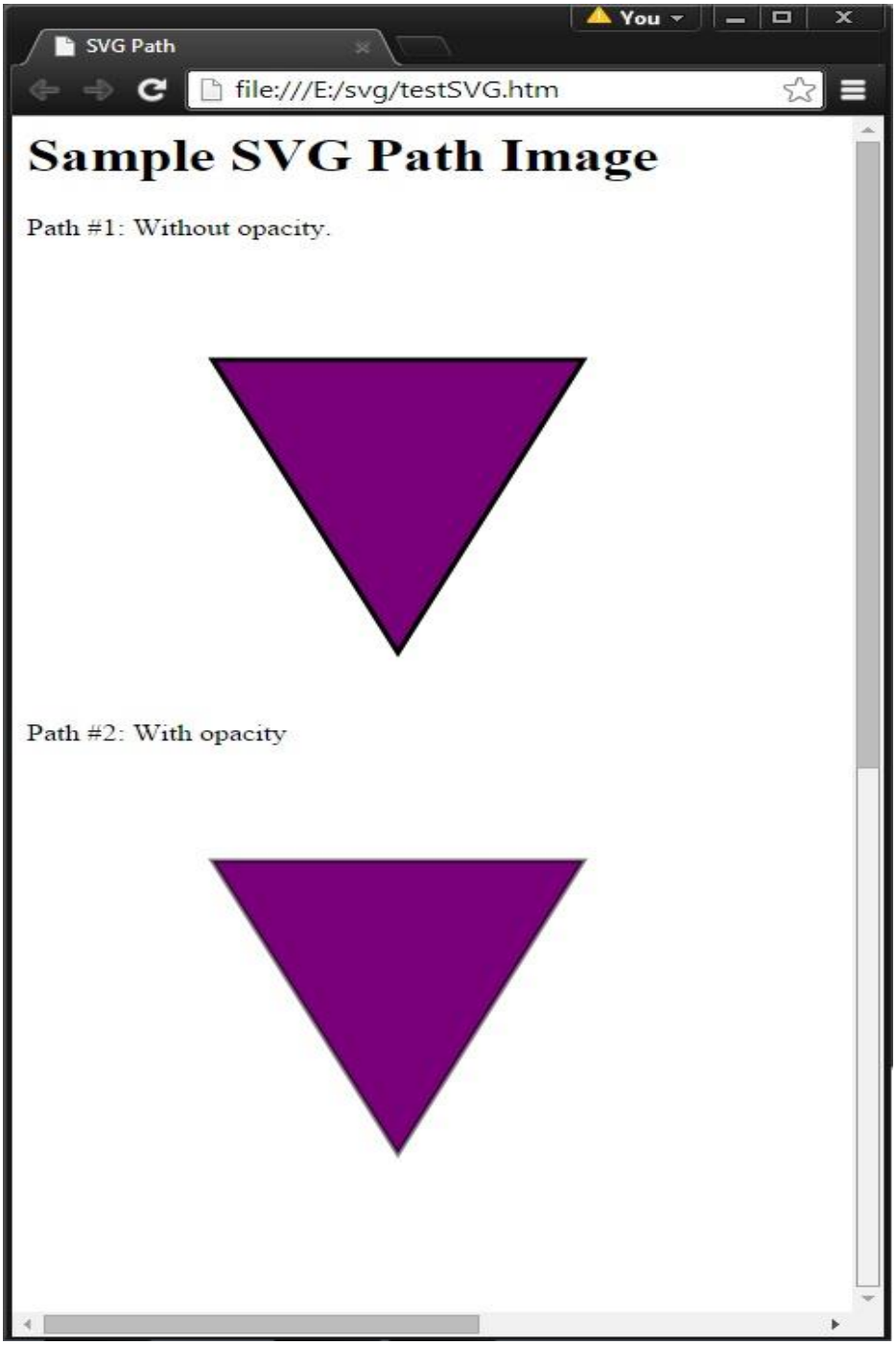
```
      stroke:rgb(0,0,0);stroke-opacity:0.5;">
   </g></svg>
</body>
</html>
```

In the above example, in first shape, M 100 100 moves drawing pointer to (100,100), L 300 100 draws a line from (100,100) to (300,100), L 200 300 draws a line from (300,100) to (200,300) and z closes the path.

Output

Open textSVG.htm in Chrome web browser. You can also use Chrome/Firefox/Opera to view SVG image directly without any plugin.

Internet Explorer 9 and higher also supports SVG image rendering.



3. SVG TEXT

<text> element is used to draw text.

Declaration

Following is the syntax declaration of **<text>** element. We've shown main attributes only.

```
<text
  x="x-cordinates"
  y="y-cordinates"
  dx="list of lengths"
  dy="list of lengths"
  rotate="list of numbers"
  textlength="length"
  lengthAdjust="spacing" >
</text>
```

Attributes

S.No.	Attribute & Description
1	**x** - x axis cordinates of glyphs.
2	**y** - y axis cordinates of glyphs.
3	**dx** - shift along with x-axis.
4	**dy** - shift along with y-axis.
5	**rotate** - rotation applied to all glyphs.

6	**textlength** - rendering length of the text.
7	**lengthAdjust** - type of adjustment with the rendered length of the text.

Example

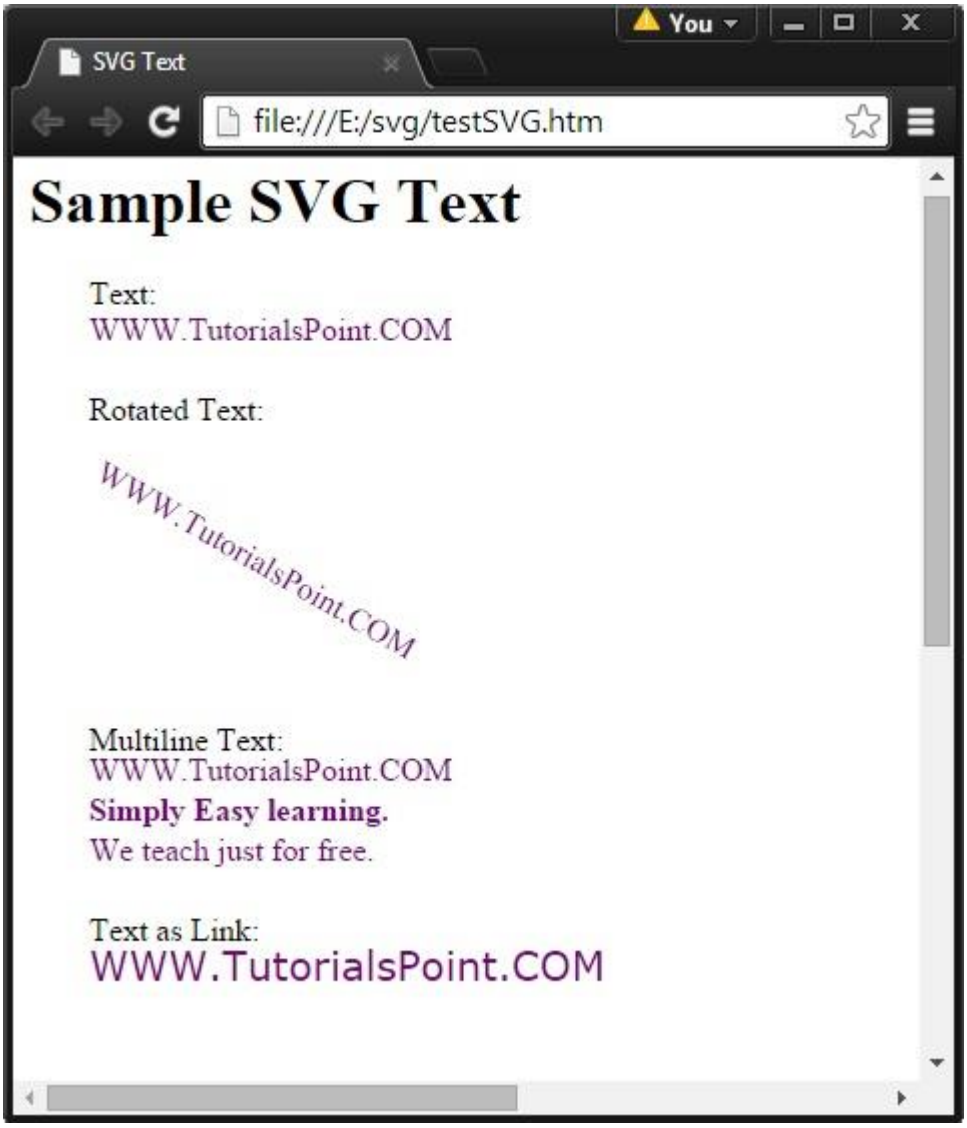
testSVG.htm

```
<html>
<title>SVG Text</title>
<body>
<h1>Sample SVG Text</h1>
<svg width="800" height="800">
   <g>
      <text x="30" y="12" >Text: </text>
      <text x="30" y="30"
fill="rgb(121,0,121)">WWW.TutorialsPoint.COM</text>
   </g>
   <g>
      <text x="30" y="70" >Rotated Text: </text>
      <text x="60" y="85" fill="rgb(121,0,121)"
      transform="rotate(30 20,40)" >WWW.TutorialsPoint.COM</text>
   </g>
   <g>
      <text x="30" y="235" >Multiline Text: </text>
      <text x="30" y="250" fill="rgb(121,0,121)">WWW.TutorialsPoint.COM
         <tspan x="30" y="270" font-weight="bold">Simply Easy
learning.</tspan>
         <tspan x="30" y="290">We teach just for free.</tspan>
      </text>
   </g>
   <g>
      <text x="30" y="330" >Text as Link: </text>
```

```
      <a xlink:href="http://www.tutorialspoint.com/svg/"
target="_blank">
         <text font-family="Verdana" font-size="20"  x="30" y="350"
         fill="rgb(121,0,121)">WWW.TutorialsPoint.COM</text>
      </a>
   </g>
</svg>
</body>
</html>
```

Output

Open textSVG.htm in Chrome web browser. You can use Chrome/Firefox/Opera to view SVG image directly without any plugin. Internet Explorer 9 and higher also supports SVG image rendering.



4. SVG STROKE

SVG supports multiple stroke properties. Following are the main stroke properties used.

S.NO.	Stroke Type & Description
1	**stroke** - defines color of text, line or outline of any element.
2	**stroke-width** - defines thickness of text, line or outline of any element.
3	**stroke-linecap** - defines different types of ending of a line or outline of any path.
4	**stroke-dasharray** - used to create dashed lines.

Example

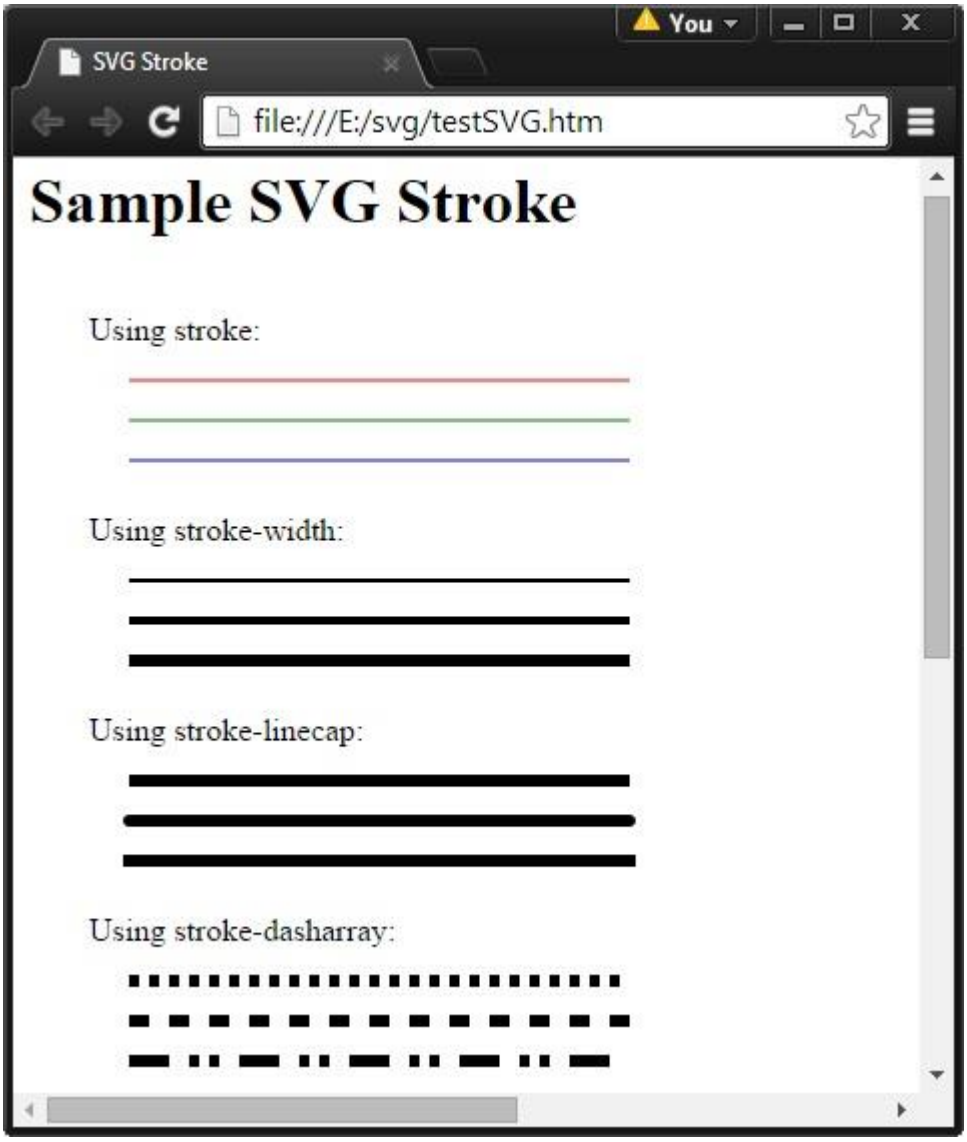
testSVG.htm

```
<html>
<title>SVG Stroke</title>
<body>
<h1>Sample SVG Stroke</h1>
<svg width="800" height="800">
   <g>
     <text x="30" y="30" >Using stroke: </text>
      <path stroke="red" d="M 50 50 L 300 50" />
      <path stroke="green" d="M 50 70 L 300 70" />
      <path stroke="blue" d="M 50 90 L 300 90" />
   </g>
   <g>
     <text x="30" y="130" >Using stroke-width: </text>
      <path stroke-width="2" stroke="black" d="M 50 150 L 300 150" />
```

```
      <path stroke-width="4" stroke="black" d="M 50 170 L 300 170" />
      <path stroke-width="6" stroke="black" d="M 50 190 L 300 190" />
   </g>
   <g>
     <text x="30" y="230" >Using stroke-linecap: </text>
      <path stroke-linecap="butt" stroke-width="6"
      stroke="black" d="M 50 250 L 300 250" />
      <path stroke-linecap="round" stroke-width="6"
      stroke="black" d="M 50 270 L 300 270" />
      <path stroke-linecap="square" stroke-width="6"
      stroke="black" d="M 50 290 L 300 290" />
   </g>
   <g>
     <text x="30" y="330" >Using stroke-dasharray: </text>
      <path stroke-dasharray="5,5" stroke-width="6"
      stroke="black" d="M 50 350 L 300 350" />
      <path stroke-dasharray="10,10" stroke-width="6"
      stroke="black" d="M 50 370 L 300 370" />
      <path stroke-dasharray="20,10,5,5,5,10" stroke-width="6"
      stroke="black" d="M 50 390 L 300 390" />
   </g>
</svg>
</body>
</html>
```

Output

Open textSVG.htm in Chrome web browser. You can use Chrome/Firefox/Opera to view SVG image directly without any plugin. Internet Explorer 9 and higher also supports SVG image rendering.



5. SVG FILTERS

SVG uses <filter> element to define filters. <filter> element uses an id attribute to uniquely identify it.

Filters are defined within <def> elements and then are referenced by graphics elements by their ids.

SVG provides a rich set of filters. Following is the list of the commonly used filters.

- feBlend
- feColorMatrix
- feComponentTransfer
- feComposite
- feConvolveMatrix
- feDiffuseLighting
- feDisplacementMap
- feFlood
- feGaussianBlur
- feImage
- feMerge
- feMorphology
- feOffset - filter for drop shadows
- feSpecularLighting
- feTile
- feTurbulence
- feDistantLight
- fePointLight
- feSpotLight

Declaration

Following is the syntax declaration of **<filter>** element. We've shown main attributes only.

```
<filter
   filterUnits="units to define filter effect region"
   primitiveUnits="units to define primitive filter subregion"
   x="x-axis co-ordinate"
   y="y-axis co-ordinate"
   width="length"
   height="length"
```

```
   filterRes="numbers for filter region"
   xlink:href="reference to another filter" >
</filter>
```

Attributes

S.No.	Name & Description
1	**Filterunits** - units to define filter effect region. It specifies the coordinate system for the various length values within the filter and for the attributes defining the filter subregion. If filterUnits="userSpaceOnUse", values represent values in the current user coordinate system in place at the time when the 'filter' element is used. If filterUnits="objectBoundingBox", values represent values in fractions or percentages of the bounding box on the referencing element in place at the time when the 'filter' element is used. Default is userSpaceOnUse.
2	**Primitiveunits** - units to define filter effect region. It specifies the coordinate system for the various length values within the filter and for the attributes defining the filter subregion. If filterUnits="userSpaceOnUse", values represent values in the current user coordinate system in place at the time when the 'filter' element is used. If filterUnits="objectBoundingBox", values represent values in fractions or percentages of the bounding box on the referencing element in place at the time when the 'filter' element is used. Default is userSpaceOnUse.
3	**X** - x-axis co-ordinate of the filter bounding box. Defeault is 0.
4	**Y** - y-axis co-ordinate of the filter bounding box. Default is 0.
5	**Width** - width of the filter bounding box. Default is 0.
6	**Height** - height of the filter bounding box. Default is 0.
7	**Filterres** - numbers representing filter regions.
8	**Xlink**:href - used to refer to another filter.

Example

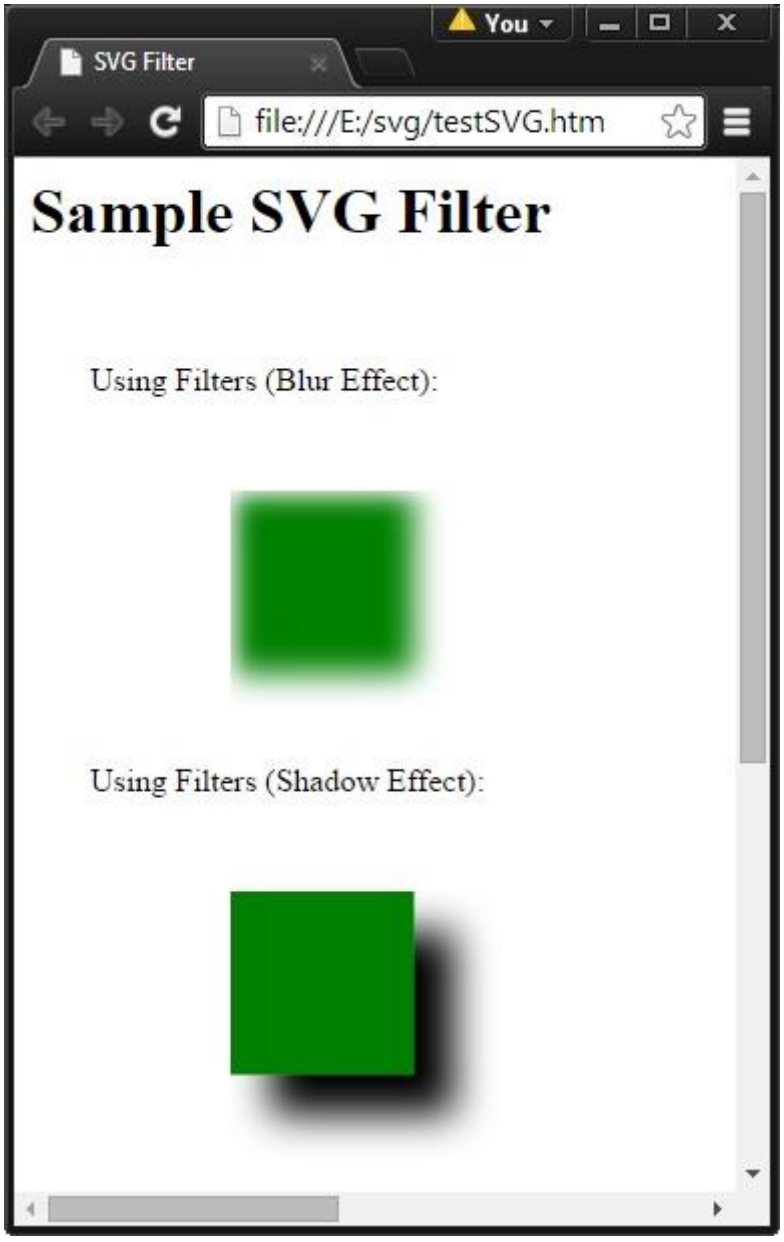
testSVG.htm

```
<html>
<title>SVG Filter</title>
<body>
<h1>Sample SVG Filter</h1>
<svg width="800" height="800">
 <defs>
    <filter id="filter1" x="0" y="0">
      <feGaussianBlur in="SourceGraphic" stdDeviation="8" />
    </filter>
     <filter id="filter2" x="0" y="0" width="200%" height="200%">
      <feOffset result="offOut" in="SourceAlpha" dx="20" dy="20" />
      <feGaussianBlur result="blurOut" in="offOut" stdDeviation="10" />
      <feBlend in="SourceGraphic" in2="blurOut" mode="normal" />
    </filter>
  </defs>

   <g>
     <text x="30" y="50" >Using Filters (Blur Effect): </text>
     <rect x="100" y="100" width="90" height="90" stroke="green" stroke-
width="3"
           fill="green" filter="url(#filter1)" />
   </g>
   <g>
     <text x="30" y="250" >Using Filters (Shadow Effect): </text>
     <rect x="100" y="300" width="90" height="90" stroke="green" stroke-
width="3"
           fill="green" filter="url(#filter2)" />
   </g>
</svg>
</body>
</html>
```

- Two <filter> elements defined as filter1 and filter2.
- feGaussianBlur filter effect defines the blur effect with the amount of blur using stdDeviation.
- in="SourceGraphic" defines that the effect is applicable for the entire element.
- feOffset filter effect is used to create shadow effect. in="SourceAlpha" defines that the effect is applicable for the alpha part of RGBA graphics.
- <rect> elements linked the filters using filter attribute.

Output

Open textSVG.htm in Chrome web browser. You can use Chrome/Firefox/Opera to view SVG image directly without any plugin. Internet Explorer 9 and higher also supports SVG image rendering.



6. SVG PATTERNS

SVG uses <pattern> element to define patterns. Patterns are defined using <pattern> element and are used to fill graphics elements in tiled fashion.

Declaration

Following is the syntax declaration of **<pattern>** element. We've shown main attributes only.

```
<pattern
   patternUnits="units to define x,y, width and height attributes."
   patternContentUnits ="units to define co-ordinate system of contents
of pattern"
   patternTransform = "definition of an additional transformation from
the pattern coordinate system onto the target coordinate system"
   x="x-axis co-ordinate"
   y="y-axis co-ordinate"
   width="length"
   height="length"
   preserveAspectRatio="to preserve width/height ratio of original
content"
   xlink:href="reference to another pattern" >
</pattern>
```

Attributes

S.No.	Name & Description
1	**patternUnits** - units to define patterns effect region. It specifies the coordinate system for the various length values within the pattern and for the attributes defining the pattern subregion. If patternUnits="userSpaceOnUse", values represent values in the current user coordinate system in place at the time when the 'pattern' element is used. If patternUnits="objectBoundingBox", values represent values in fractions or percentages of the bounding box on the referencing element in place at the time when the 'pattern' element is used. Default is userSpaceOnUse.

2	**patternContentUnits** - units to define pattern content region. It specifies the coordinate system for the various length values within the pattern and for the attributes defining the pattern subregion. If patternContentUnits="userSpaceOnUse", values represent values in the current user coordinate system in place at the time when the 'pattern' element is used. If patternContentUnits="objectBoundingBox", values represent values in fractions or percentages of the bounding box on the referencing element in place at the time when the 'pattern' element is used. Default is userSpaceOnUse.
3	**x** - x-axis co-ordinate of the pattern bounding box. Defeault is 0.
4	**y** - y-axis co-ordinate of the pattern bounding box. Default is 0.
5	**width** - width of the pattern bounding box. Default is 0.
6	**height** - height of the pattern bounding box. Default is 0.
7	**preserveAspectRatio** - to preserve width/height ratio of original content.
8	**xlink**:**href** - used to refer to another pattern.

Example

testSVG.htm

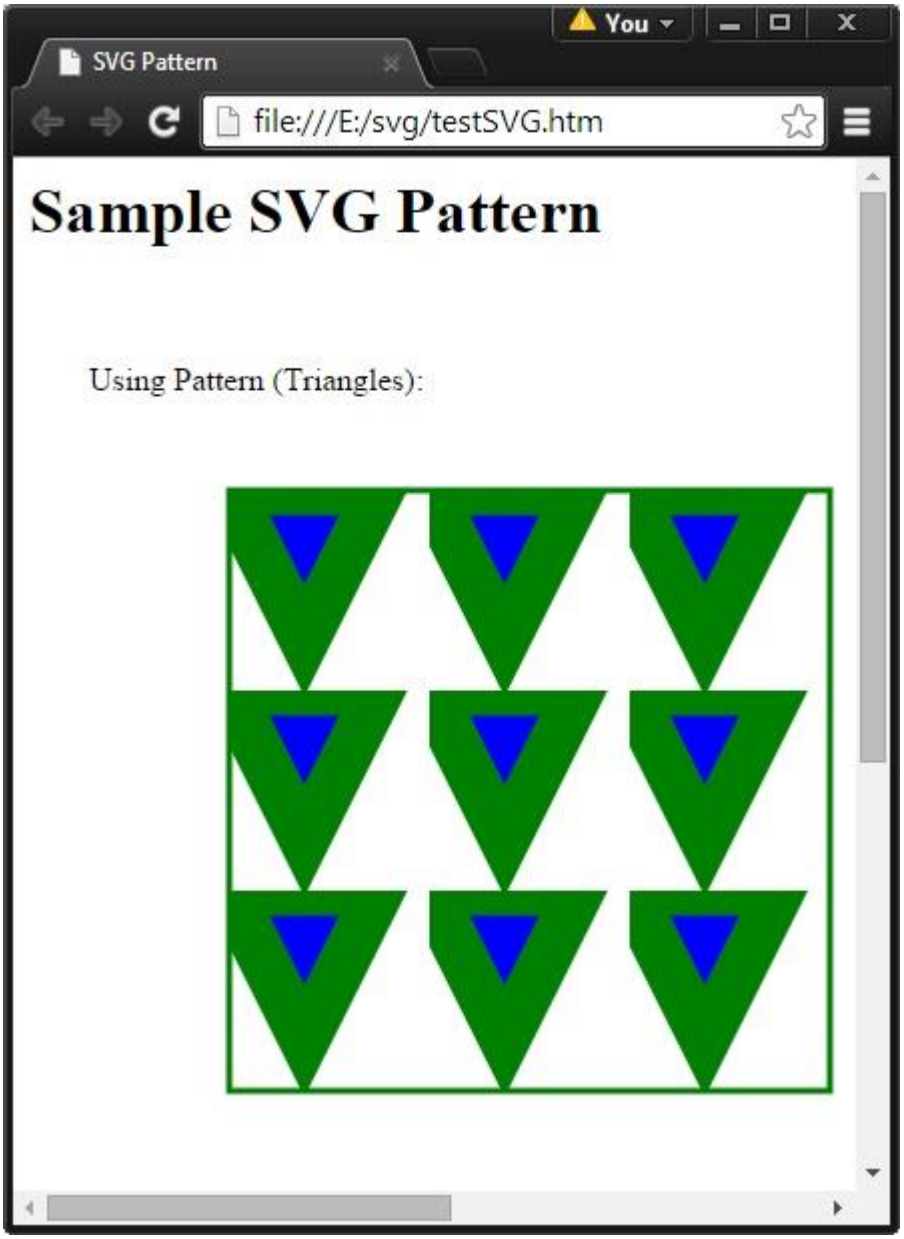
```
<html>
   <title>SVG Pattern</title>
   <body>
   <h1>Sample SVG Pattern</h1>
   <svg width="800" height="800">
   <defs>
      <pattern id="pattern1" patternUnits="userSpaceOnUse"
         x="0" y="0" width="100" height="100"
         viewBox="0 0 4 4" >
         <path d="M 0 0 L 3 0 L 1.5 3 z" fill="blue" stroke="green" />
      </pattern>
   </defs>
   <g>
```

```
      <text x="30" y="50" >Using Pattern (Triangles): </text>
      <rect x="100" y="100" width="300" height="300" stroke="green"
      stroke-width="3" fill="url(#pattern1)" />
   </g>
   </svg>
</body>
</html>
```

- One <pattern> element defined as pattern1.
- In pattern, a viewbox is defined and a path which is to be used as pattern is defined.
- in rect element, in fill attribute, url of the pattern is specified to fill the rectangle with pattern created earlier.

Output

Open textSVG.htm in Chrome web browser. You can use Chrome/Firefox/Opera to view SVG image directly without any plugin. Internet Explorer 9 and higher also supports SVG image rendering.



7. SVG GRADIENTS

Gradient refers to smooth transition of one color to another color within a shape. SVG provides two types of gradients.

- **Linear Gradients** - Represents linear transition of one color to another from one direction to another.
- **Radial Gradients** - Represents circular transition of one color to another from one direction to another.

Linear Gradients Declaration

Following is the syntax declaration of **<linearGradient>** element. We've shown main attributes only.

```
<linearGradient
   gradientUnits ="units to define co-ordinate system of contents of
gradient"
   gradientTransform = "definition of an additional transformation from
the gradient coordinate system onto the target coordinate system"
   x1="x-axis co-ordinate"
   y1="y-axis co-ordinate"
   x2="x-axis co-ordinate"
   y2="y-axis co-ordinate"
   spreadMethod="indicates method of spreading the gradient within
graphics element"
   xlink:href="reference to another gradient" >
</linearGradient>
```

Attributes

S.No.	Name & Description
1	gradientUnits - units to define the coordinate system for the various length values within the gradient. If gradientUnits="userSpaceOnUse", values represent values in the current user coordinate system in place at the time when the gradient element is used. If patternContentUnits="objectBoundingBox", values represent values in fractions or percentages of the bounding box on the referencing element

	in place at the time when the gradient element is used. Default is userSpaceOnUse.
2	**x1** - x-axis co-ordinate of the gradient vector. Defeault is 0.
3	**y1** - y-axis co-ordinate of the gradient vector. Default is 0.
4	**x2** - x-axis co-ordinate of the gradient vector. Defeault is 0.
5	**y2** - y-axis co-ordinate of the gradient vector. Default is 0.
6	**spreadMethod** - indicates method of spreading the gradient within graphics element. Default is 'pad'.
7	**xlink:href** - used to refer to another gradient.

Example

testSVG.htm

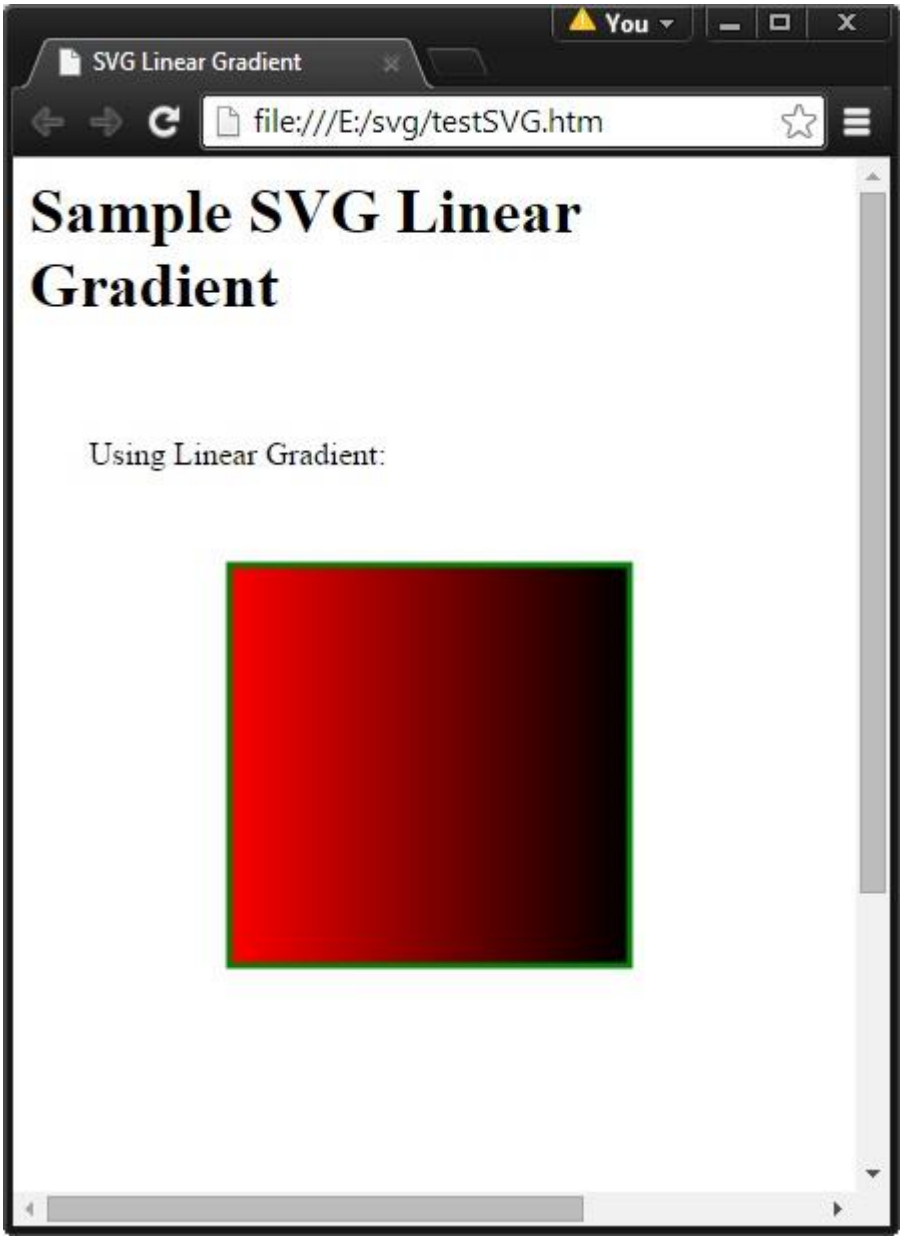
```
<html>
<title>SVG Linear Gradient</title>
<body>
<h1>Sample SVG Linear Gradient</h1>
<svg width="600" height="600">
 <defs>
     <linearGradient id="sampleGradient">
        <stop offset="0%" stop-color="#FF0000" />
        <stop offset="100%" stop-color="#00FFF00" />
      </linearGradient>
  </defs>

   <g>
     <text x="30" y="50" >Using Linear Gradient: </text>
    <rect x="100" y="100" width="200" height="200" stroke="green"
stroke-width="3"
           fill="url(#sampleGradient)" />
   </g>
```

```
</svg>
</body>
</html>
```

- One <linearGradient> element defined as sampleGradient.
- In linearGradient, two offsets are defined with two colors.
- in rect element, in fill attribute, url of the gradient is specified to fill the rectangle with gradient created earlier.

Output

Open textSVG.htm in Chrome web browser. You can use Chrome/Firefox/Opera to view SVG image directly without any plugin. Internet Explorer 9 and higher also supports SVG image rendering.



Radial Gradients Declaration

Following is the syntax declaration of **<radialGradient>** element. We've shown main attributes only.

```
<radialGradient

   gradientUnits ="units to define co-ordinate system of contents of
gradient"

   gradientTransform = "definition of an additional transformation from
the gradient coordinate system onto the target coordinate system"

   cx="x-axis co-ordinate of center of circle."

   cy="y-axis co-ordinate of center of circle."

   r="radius of circle"

   fx="focal point for the radial gradient"

   fy="focal point for the radial gradient"

   spreadMethod="indicates method of spreading the gradient within
graphics element"

   xlink:href="reference to another gradient" >

</radialGradient>
```

Attributes

S.NO.	Name & Description
1	gradientUnits - units to define the coordinate system for the various length values within the gradient. If gradientUnits="userSpaceOnUse", values represent values in the current user coordinate system in place at the time when the gradient element is used. If patternContentUnits="objectBoundingBox", values represent values in fractions or percentages of the bounding box on the referencing element in place at the time when the gradient element is used. Default is userSpaceOnUse.
2	cx - x-axis co-ordinate of the center of largest circle of gradient vector. Defeault is 0.
3	cy - y-axis co-ordinate of the center of largest circle of gradient vector. Default is 0.
4	r - radius of the center of largest circle of gradient vector. Defeault is 0.

5	fx - focal point of radial gradient. Default is 0.
6	fy - focal point of radial gradient. Default is 0.
7	spreadMethod - indicates method of spreading the gradient within graphics element. Default is 'pad'.
8	xlink:href - used to refer to another gradient.

Example

testSVG.htm

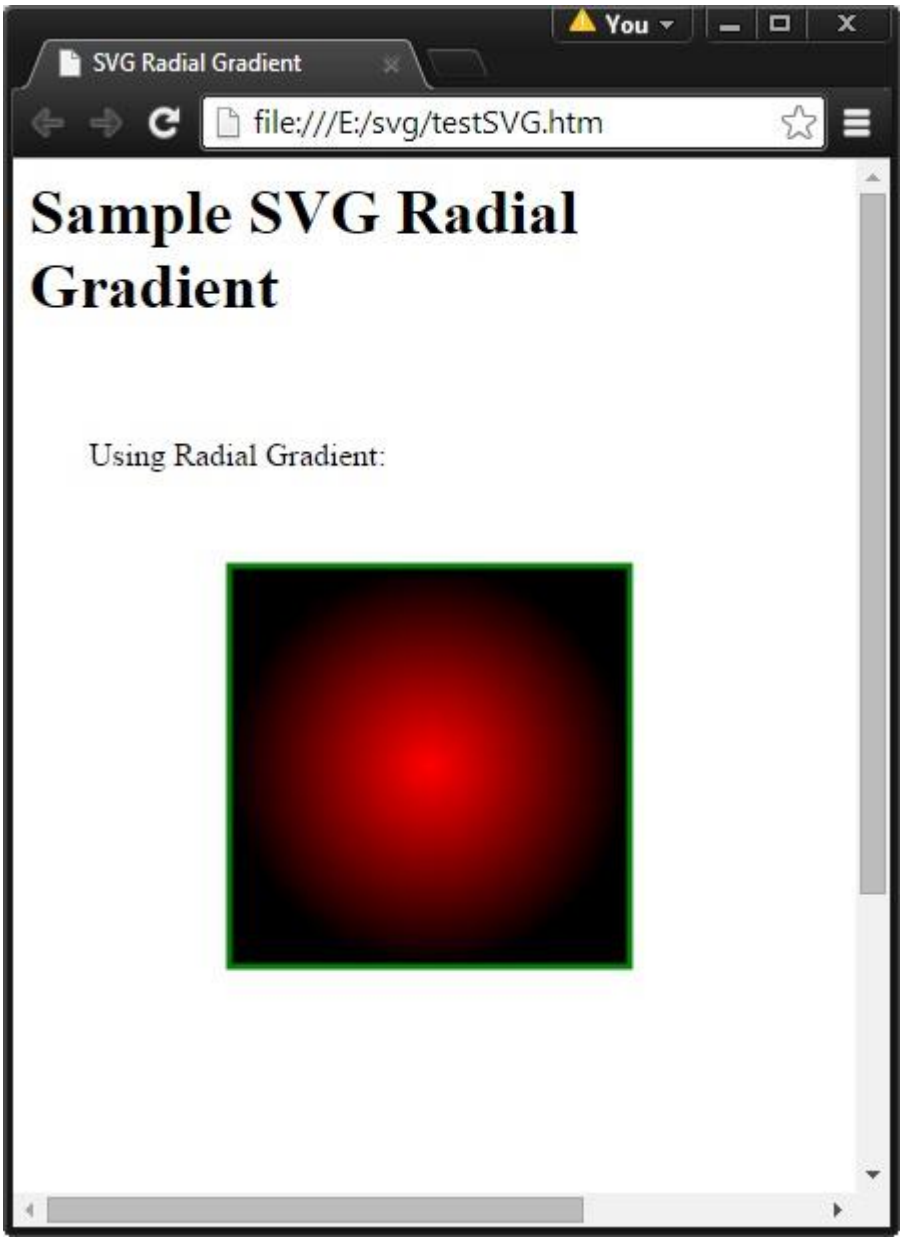
```
<html>
<title>SVG Radial Gradient</title>
<body>
<h1>Sample SVG Radial Gradient</h1>
<svg width="600" height="600">
 <defs>
     <radialGradient id="sampleGradient">
        <stop offset="0%" stop-color="#FF0000" />
        <stop offset="100%" stop-color="#00FFF00" />
      </radialGradient>
  </defs>

   <g>
     <text x="30" y="50" >Using Radial Gradient: </text>
     <rect x="100" y="100" width="200" height="200" stroke="green"
stroke-width="3"
           fill="url(#sampleGradient)" />
   </g>
</svg>
</body>
</html>
```

- One <radialGradient> element defined as sampleGradient.
- In radialGradient, two offsets are defined with two colors.

- in rect element, in fill attribute, url of the gradient is specified to fill the rectangle with gradient created earlier.

Output

Open textSVG.htm in Chrome web browser. You can use Chrome/Firefox/Opera to view SVG image directly without any plugin. Internet Explorer 9 and higher also supports SVG image rendering.



8. SVG INTERACTIVITY

SVG images can be made responsive to user actions. It supports pointer events, keyboard events and document events. Consider the following example.

Example

testSVG.htm

```
<html>
<title>SVG Interactivity</title>
<body>
<h1>Sample Interactivity</h1>
<svg width="600" height="600">
   <script type="text/JavaScript">
      <![CDATA[
         function showColor() {
            alert("Color of the Rectangle is: "+

document.getElementById("rect1").getAttributeNS(null,"fill"));
         }

         function showArea(event){
            var width =
parseFloat(event.target.getAttributeNS(null,"width"));
            var height =
parseFloat(event.target.getAttributeNS(null,"height"));
            alert("Area of the rectangle is: " +width +"x"+ height);
         }

         function showRootChildrenCount() {
            alert("Total Children:
"+document.documentElement.childNodes.length);
         }
      ]]>
```

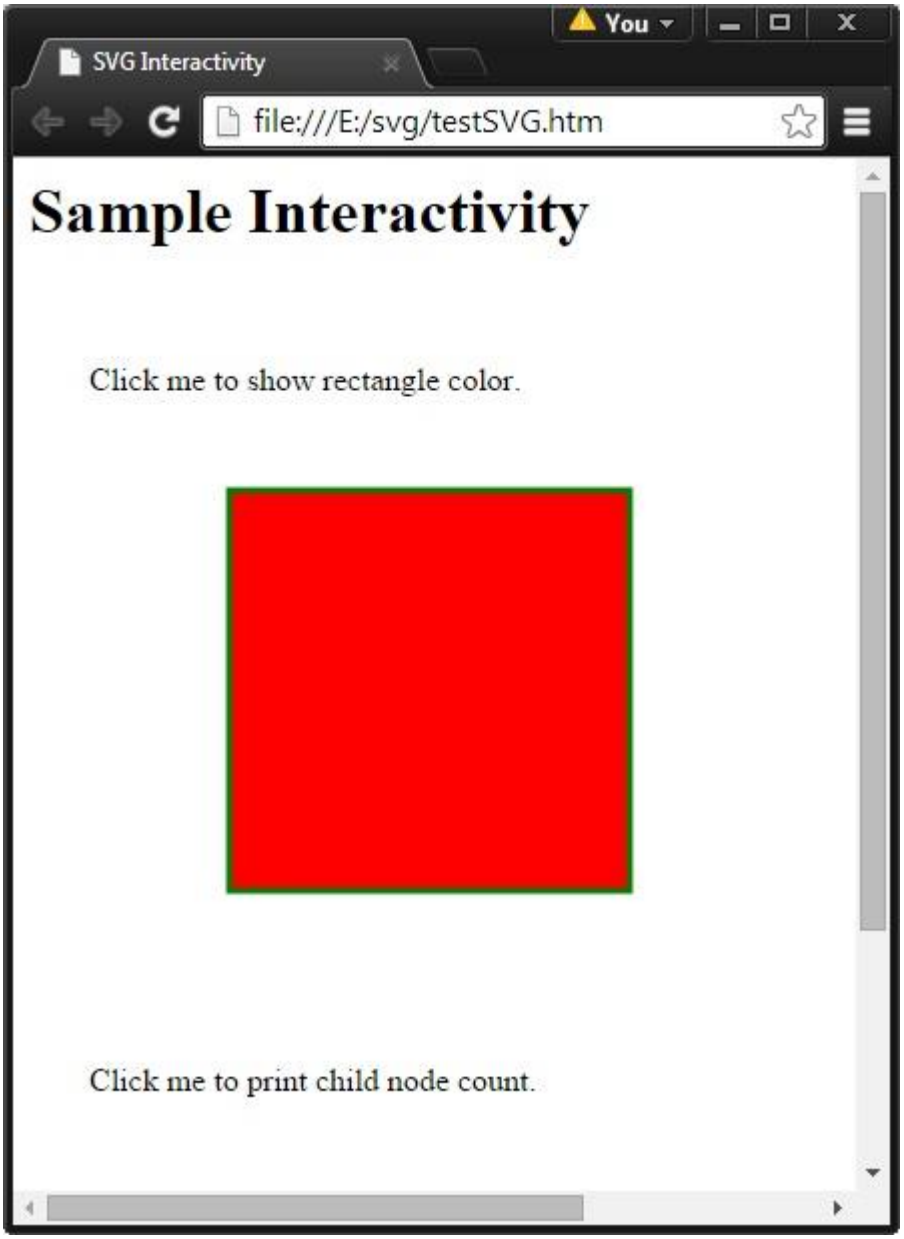
```
   </script>
   <g>
      <text x="30" y="50" onClick="showColor()">Click me to show
rectangle color.</text>
      <rect id="rect1" x="100" y="100" width="200" height="200"
         stroke="green" stroke-width="3" fill="red"
         onClick="showArea(event)"
      />
      <text x="30" y="400" onClick="showRootChildrenCount()">
      Click me to print child node count.</text>
   </g>
</svg>
</body>
</html>
```

Explanation

- SVG supports JavaScript/ECMAScript functions. Script block is to be in CDATA block consider character data support in XML.
- SVG elements support mouse events, keyboard events. We've used onClick event to call a javascript functions.
- In javascript functions, document represents SVG document and can be used to get the SVG elements.
- In javascript functions, event represents current event and can be used to get the target element on which event got raised.

Output

Open textSVG.htm in Chrome web browser. You can use Chrome/Firefox/Opera to view SVG image directly without any plugin. Internet Explorer 9 and higher also supports SVG image rendering. Click on each text and rectangle to see the result.



9. SVG LINKING

<a> element is used to create hyperlink. "xlink:href" attribute is used to pass the IRI (Internationalized Resource Identifiers) which is complementary to URI (Uniform Resource Identifiers).

Declaration

Following is the syntax declaration of **<a>** element. We've shown main attributes only.

```
<a
   xlink:show = "new" | "replace"
   xlink:actuate = "onRequest"
   xlink:href = "<IRI>"
   target = "_replace" | "_self" | "_parent" | "_top" | "_blank" |
"<XML-Name>" >
</a>
```

Attributes

S.No.	Name & Description
1	**xlink:show** - for documentation purpose for XLink aware processors. Default is new.
2	**xlink:actuate** - for documentation purpose for XLink aware processors.
3	**xlink:href** - location of the referenced object.
4	**target** - used when targets for the ending resource are possible.

Example

testSVG.htm

```
<html>
<title>SVG Linking</title>
```

```
<body>
<h1>Sample Link</h1>
<svg width="800" height="800">
   <g>
      <a xlink:href="http://www.tutorialspoint.com">
         <text x="0" y="15" fill="black" >
         Click me to load TutorialsPoint DOT COM.</text>
       </a>

   </g>
   <g>
      <text x="0" y="65" fill="black" >
      Click in the rectangle to load TutorialsPoint DOT COM</text>
       <a xlink:href="http://www.tutorialspoint.com">
       <rect x="100" y="80" width="300" height="100"
      style="fill:rgb(121,0,121);stroke-width:3;stroke:rgb(0,0,0)" />
       </a>
   </g>
</svg>
</body>
</html>
```

Output

Open textSVG.htm in Chrome web browser. You can use Chrome/Firefox/Opera to view SVG image directly without any plugin. Internet Explorer 9 and higher also supports SVG image rendering. Click on link and rectangle to see the result.