## Review

- What is Computing?
- Occupations in CS
- What can be Programmed?
- Creative Computing
- Processing
- Downloading Processing
- Sketchpad
- Primitive Shapes
  - point
  - line
  - triangle
  - quad
  - rect
  - ellipse
- Processing Canvas
- Coordinate System
- Shape Formatting
  - Colors
  - Stroke
  - Fill

## Comments

- Used to explain your source code
- Ignored by Processing

```
/* This is a comment
   that spans multiple lines */

// This is a comment that is restricted to a single line

line(0, 0, 10, 10);    // Can start anywhere, continue to line end
```

Note the color of the various items in the processing editor.

```
void setup()
{
  // Called once when program starts
}

void draw()
{
  /* Called repeatedly
     while program runs */
}
```

**random(*high*);**
**random(*low*, *high*);**

Generate a random number in the range *low* (or 0) to *high*

**print( *something* );**
**println( *something* );**

Print something to the Processing console.

**mouseX**
**mouseY**

Built-in predefined variables that hold the current mouse X and Y locations.

## randomEllipse

```
void setup()
{
  size(300, 300);
  smooth();
}

void draw()
{
  fill(random(255), random(255), random(255));
  ellipse(mouseX, mouseY, 30, 30);
}
```

## Controlling draw()

**frameRate(*fps*);**

Sets number of frames displayed per second. i.e. the number of times draw() is called per second. Default = 60.

**noLoop();**

Stops continuously calling draw().

**loop();**

Resumes calling draw().

## More Graphics

arc(…)
curve (…)
bézier(…)
shape(…)

## Arcs

```
arc( x, y, width, height, start, stop );
```

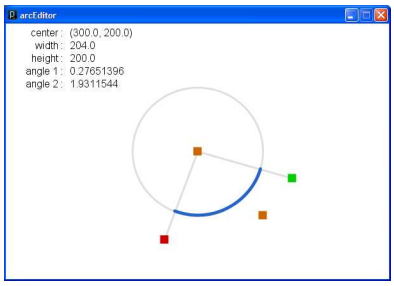
*An arc is a section of an ellipse*

**`x, y, width, height`**
location and size of the ellipse

**`start, stop`**
arc bounding angles (in radians)

## Arcs

```
arc( x, y, width, height, start, stop );
```




arcEditor.pde

## Spline Curves

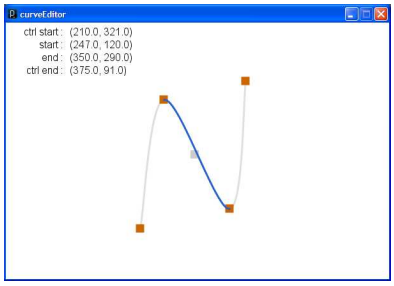
```
curve( x1, y1, x2, y2, x3, y3, x4, y4 );
```

*Spline: A smooth line drawn through a series of points*
*A curve is a Catmull-Rom (cubic Hermite) spline defined by four points*

`x2, y2` *and* `x3, y3`
*beginning/end points of visual part of curve*
`x1, y1` *and* `x4, y4`
*control points that define curve curvature*

## Spline Curves

```
curve( x1, y1, x2, y2, x3, y3, x4, y4 );
```




curveEditor.pde

## Bézier Curves

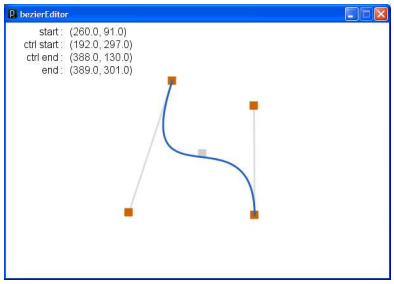
```
bezier( x1, y1, cx1, cy1, cx2, cy2, x2, y2 );
```

*A smooth curve defined by two anchor points and two control points*

`x2, y2` *and* `x2, y2`
*anchor points of bézier curve*
`cx1, cy1` *and* `cx2, cy2`
*control points that define curvature*

## Bézier Curves

```
bezier( x1, y1, cx1, cy1, cx2, cy2, x2, y2 );
```



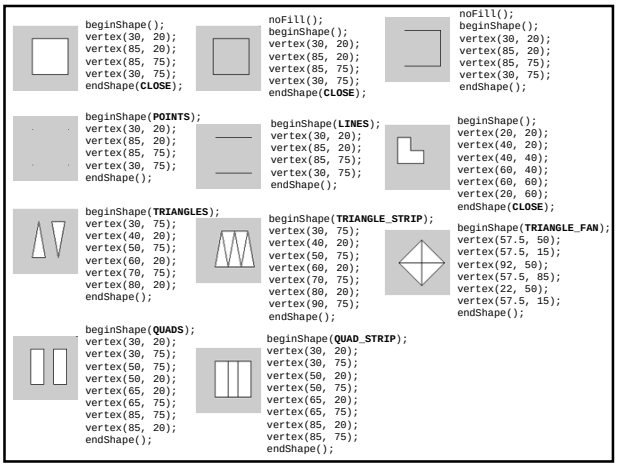

bezierEditor.pde
Inkscape

## Custom Shapes

- Composed of a series of vertexes (points)
- Vertexes may or may not be connected with lines
- Lines may join at vertexes in a variety of manners
- Lines may be straight, curved, or bézier splines
- Shapes may be closed or open

## Custom Shapes

```
beginShape( [option] );
vertex( x, y );
curveVertex( x, y );
bezierVertex( cx1, cy1, cx2, cy2, x, y );
endShape( [CLOSE] );
```



```
beginShape();
vertex(30, 20);
vertex(85, 20);
vertex(85, 75);
vertex(30, 75);
endShape(CLOSE);
```

```
noFill();
beginShape();
vertex(30, 20);
vertex(85, 20);
vertex(85, 75);
vertex(30, 75);
endShape(CLOSE);
```

```
noFill();
beginShape();
vertex(30, 20);
vertex(85, 20);
vertex(85, 75);
vertex(30, 75);
endShape();
```

```
beginShape(POINTS);
vertex(30, 20);
vertex(85, 20);
vertex(85, 75);
vertex(30, 75);
endShape();
```

```
beginShape(LINES);
vertex(30, 20);
vertex(85, 20);
vertex(85, 75);
vertex(30, 75);
endShape();
```

```
beginShape();
vertex(20, 20);
vertex(40, 20);
vertex(40, 40);
vertex(60, 40);
vertex(60, 60);
vertex(20, 60);
endShape(CLOSE);
```

```
beginShape(TRIANGLES);
vertex(30, 75);
vertex(40, 20);
vertex(50, 75);
vertex(60, 20);
vertex(70, 75);
vertex(80, 20);
endShape();
```

```
beginShape(TRIANGLE_STRIP);
vertex(30, 75);
vertex(40, 20);
vertex(50, 75);
vertex(60, 20);
vertex(70, 75);
vertex(80, 20);
vertex(90, 75);
endShape();
```

```
beginShape(TRIANGLE_FAN);
vertex(57.5, 50);
vertex(57.5, 15);
vertex(92, 50);
vertex(57.5, 85);
vertex(22, 50);
vertex(57.5, 15);
endShape();
```

```
beginShape(QUADS);
vertex(30, 20);
vertex(30, 75);
vertex(50, 75);
vertex(50, 20);
vertex(65, 20);
vertex(65, 75);
vertex(85, 75);
vertex(85, 20);
endShape();
```

```
beginShape(QUAD_STRIP);
vertex(30, 20);
vertex(30, 75);
vertex(50, 20);
vertex(50, 75);
vertex(65, 20);
vertex(65, 75);
vertex(85, 20);
vertex(85, 75);
endShape();
```

## strokeJoin()

```
noFill();
smooth();
strokeWeight(10.0);
strokeJoin(MITER);
beginShape();
vertex(35, 20);
vertex(65, 50);
vertex(35, 80);
endShape();
```

```
noFill();
smooth();
strokeWeight(10.0);
strokeJoin(BEVEL);
beginShape();
vertex(35, 20);
vertex(65, 50);
vertex(35, 80);
endShape();
```

```
noFill();
smooth();
strokeWeight(10.0);
strokeJoin(ROUND);
beginShape();
vertex(35, 20);
vertex(65, 50);
vertex(35, 80);
endShape();
```

## Example Sketches…

- LadyBug1
- Monster1
- Ndebele
- Penguin1
- SouthParkCharacter1
- Sushi
- GiorgioMorandi

## Dropbox

- https://www.dropbox.com/