Review

- What is Computing?
- Occupations in CS?
- What can be Programmed?
- Creative Computing
- Processing
- Downloading Processing
- Dropbox
- Sketchpad
- Assignment #1
- 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.

`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.

`key`

Always contains the ***value*** of the most recent key pressed on the keyboard.

`keyCode`

Always contains a number that codes for the most recent key pressed, even keys that cannot be printed.

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

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

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().

```
void mousePressed() {
   // Called when the mouse is pressed
}

void mouseReleased() {
   // Called when the mouse is released
}

void mouseClicked() {
   // Called when the mouse is pressed and released
   // at the same mouse position
}

void mouseMoved() {
   // Called while the mouse is being moved
   // with the mouse button released
}

void mouseDragged() {
   // Called while the mouse is being moved
   // with the mouse button pressed
}
```

```
void keyPressed() {
  // Called each time a key is pressed
}

void keyReleased() {
  // Called each time a key is released
}

void keyTyped() {
  // Called when an alpha-numeric key is pressed
  // Called repeatedly if the key is held down
}
```

keyCode vs. key

key

– A built-in variable that holds the character that was just typed at the keyboard

keyCode

– A built-in variable that hold the numeric code for the keyboard key that was touched

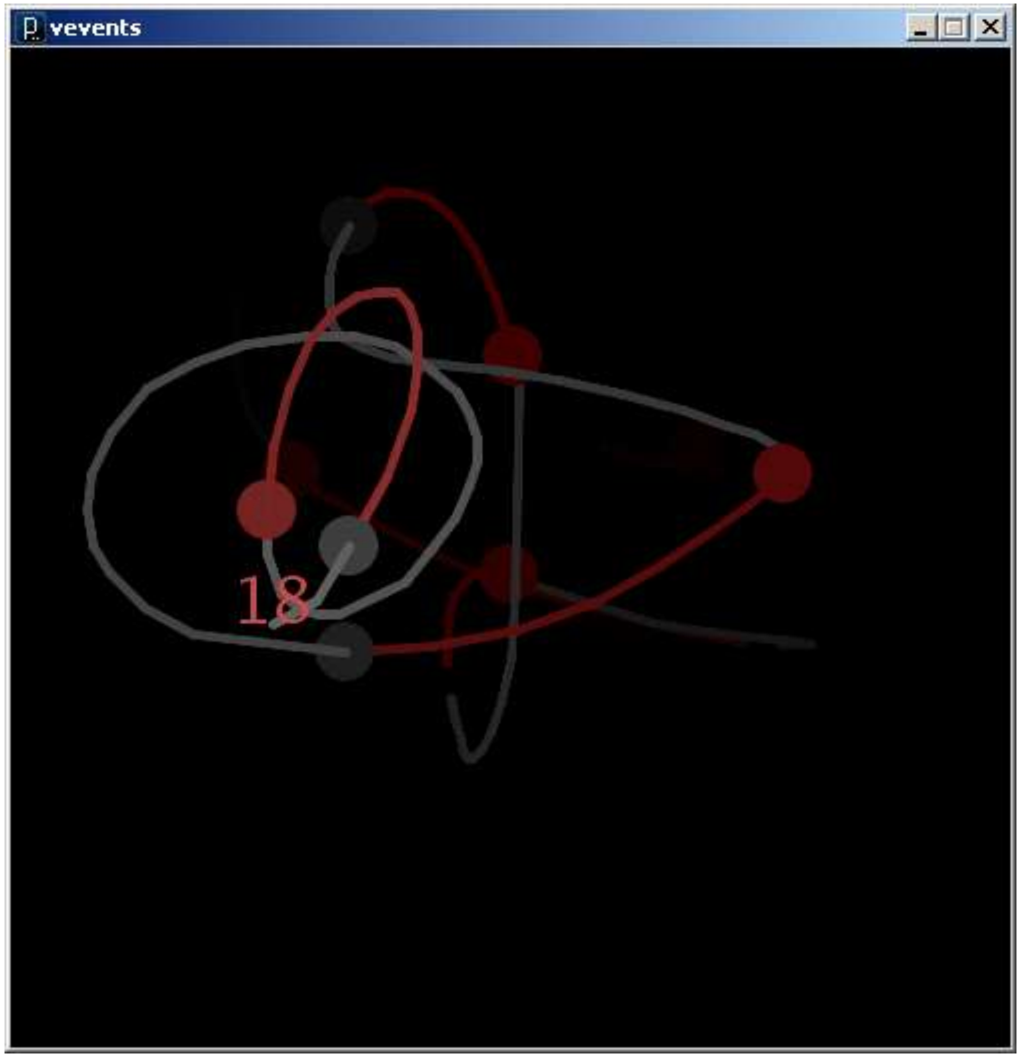
All built-in keyboard interaction functions …

- Set *keyCode* to the integer that codes for the keyboard key
- Set *key* to the character typed
- All keyboard keys have a *keyCode* value
- Not all have a *key* value

ASCII - American Standard Code for Information Interchange

	0	1	2	3	4	5	6	7	8	9
30				!	"	#	$	%	&	'
40	(	)	*	+	,	-	.	/	0	1
50	2	3	4	5	6	7	8	9	:	;
60	<	=	>	?	@	A	B	C	D	E
70	F	G	H	I	J	K	L	M	N	O
80	P	Q	R	S	T	U	V	W	X	Y
90	Z	[	\	]	^	_	`	a	b	c
100	d	e	f	g	h	i	j	k	l	m
110	n	o	p	q	r	s	t	u	v	w
120	x	y	z	{	|	}	~	•	€	
130	‚	ƒ	„	…	†	‡	ˆ	‰	Š	‹
140	Œ	⍰	Ž	⍰	⍰	‘	’	“	”	•
150	–	—	˜	™	š	›	œ	⍰	ž	Ÿ
160		¡	¢	£	¤	¥	¦			©
170	ª	«	¬	-	®	¯			²	³
180		µ	¶	·	¸	¹	º	»	¼	½
190	¾	¿	À	Á	Â	Ã	Ä	Å	Æ	Ç
200	È	É	Ê	Ë	Ì	Í	Î	Ï	Ð	Ñ
210	Ò	Ó	Ô	Õ	Ö		Ø	Ù	Ú	Û
220	Ü	Ý	Þ	ß	à	á	â	ã	ä	å
230	æ	ç	è	é	ê	ë	ì	í	î	ï
240	ð	ñ	ò	ó	ô	õ	ö		ø	ù
250	ú	û	ü	ý	þ	ÿ				

vevents.pde



More Graphics

arc(…)

curve (…)

bézier(…)

shape(…)

Arcs

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

An <u>arc</u> is a section of an ellipse

`x, y, width, height`

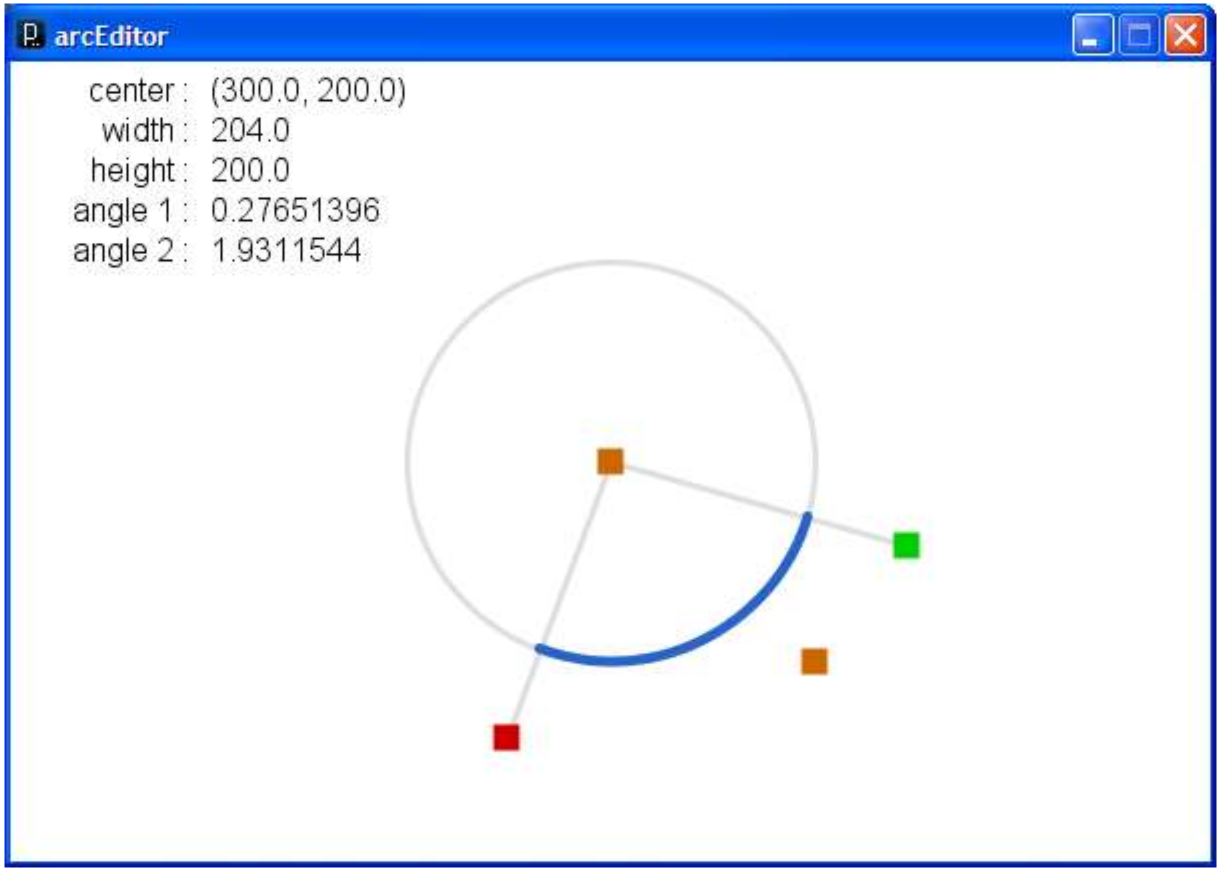
location and size of the ellipse

`start, stop`

arc bounding angles (in radians)

Arcs

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



```
   center :  (300.0, 200.0)
    width :  204.0
   height :  200.0
  angle 1 :  0.27651396
  angle 2 :  1.9311544
```

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`

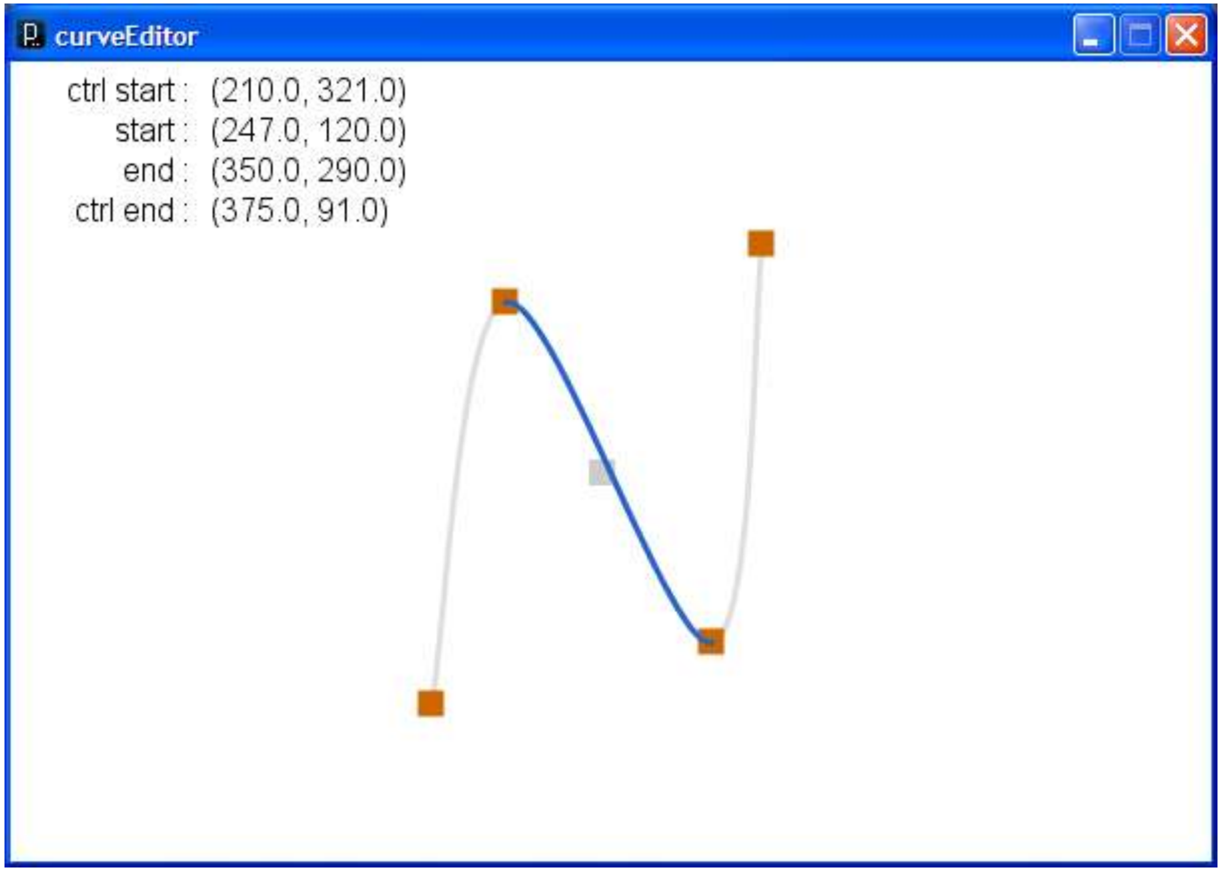
beginning/end points of visual part of curve

`x1, y1` *and* `x4, y4`

control points that define curve curvature

Spline Curves

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



```
ctrl start :  (210.0, 321.0)
     start :  (247.0, 120.0)
       end :  (350.0, 290.0)
  ctrl end :  (375.0, 91.0)
```

curveEditor.pde

Bézier Curves

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

A smooth curve defined by two <u>anchor points</u> and two <u>control points</u>

`x2, y2` *and* `x2, y2`

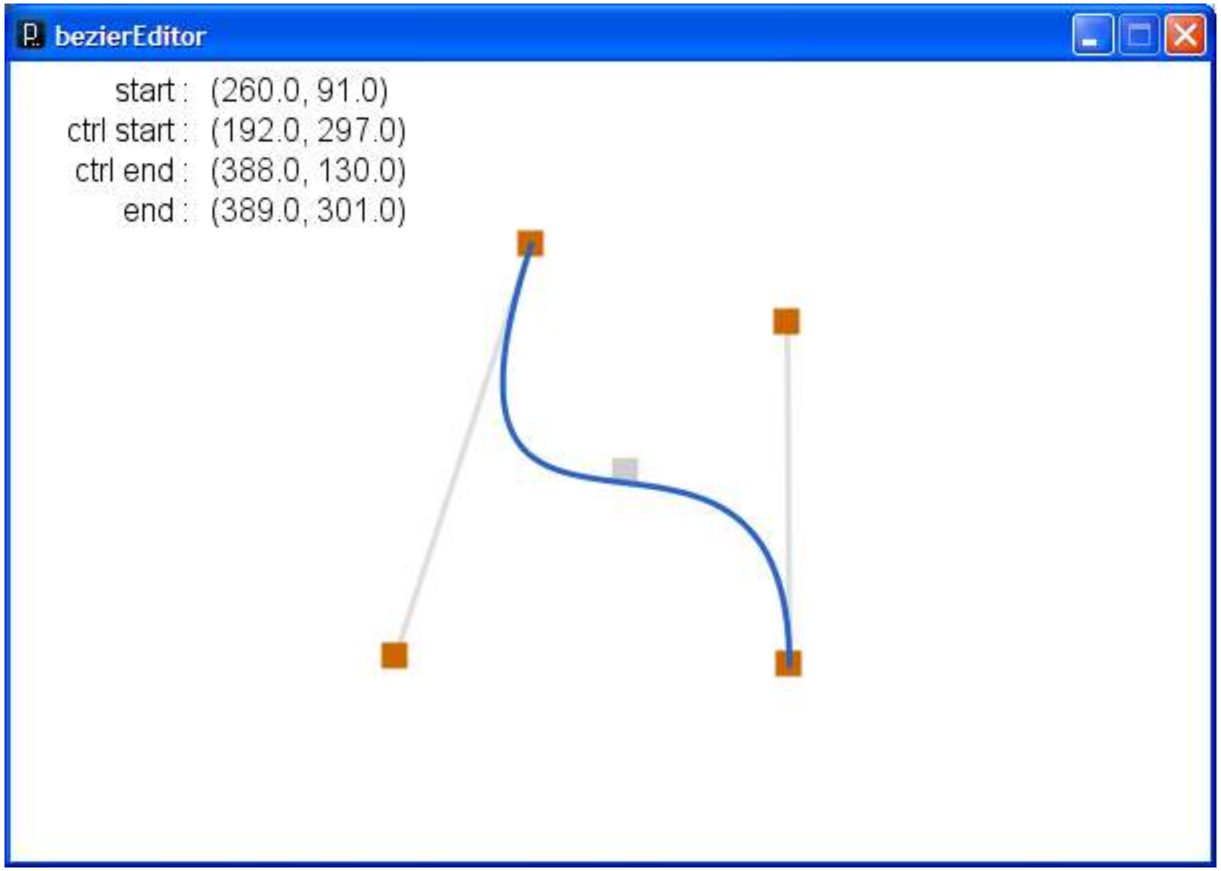
anchor points of bézier curve

`cx1, cy1` *and* `cx2, cy2`

control points that define curvature

Bézier Curves

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



```
     start :  (260.0, 91.0)
ctrl start :  (192.0, 297.0)
  ctrl end :  (388.0, 130.0)
       end :  (389.0, 301.0)
```

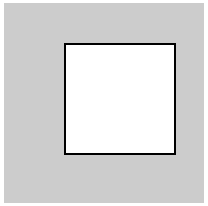
bezierEditor.pde
Inkscape

Custom Shapes

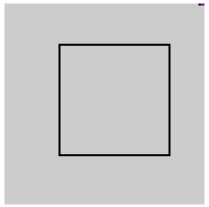
- Composed of a series of vertexes (points)
- Vertexes may or may not be connected with lines
- Lines may join at vertexes in a variety of manners
- Lines may be straight, curved, or bézier splines
- Shapes may be closed or open

Custom Shapes

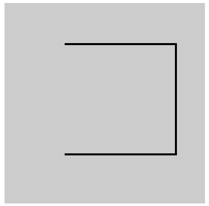
```
beginShape( [option] );

vertex( x, y );

curveVertex( x, y );

bezierVertex( cx1, cy1, cx2, cy2, x, y );

endShape( [CLOSE] );
```



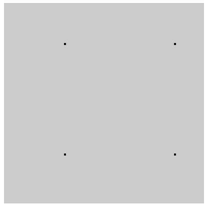
```
beginShape();
vertex(30, 20);
vertex(85, 20);
vertex(85, 75);
vertex(30, 75);
endShape(CLOSE);
```



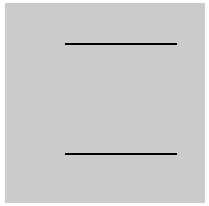
```
noFill();
beginShape();
vertex(30, 20);
vertex(85, 20);
vertex(85, 75);
vertex(30, 75);
endShape(CLOSE);
```



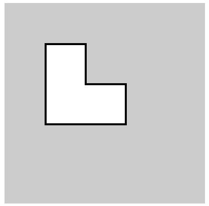
```
noFill();
beginShape();
vertex(30, 20);
vertex(85, 20);
vertex(85, 75);
vertex(30, 75);
endShape();
```



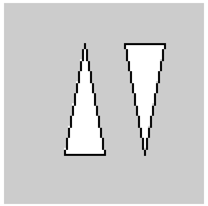
```
beginShape(POINTS);
vertex(30, 20);
vertex(85, 20);
vertex(85, 75);
vertex(30, 75);
endShape();
```



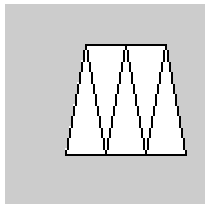
```
beginShape(LINES);
vertex(30, 20);
vertex(85, 20);
vertex(85, 75);
vertex(30, 75);
endShape();
```



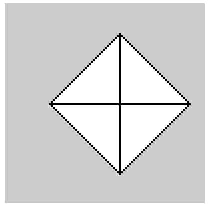
```
beginShape();
vertex(20, 20);
vertex(40, 20);
vertex(40, 40);
vertex(60, 40);
vertex(60, 60);
vertex(20, 60);
endShape(CLOSE);
```



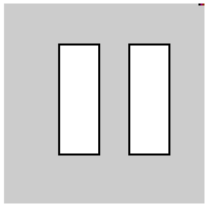
```
beginShape(TRIANGLES);
vertex(30, 75);
vertex(40, 20);
vertex(50, 75);
vertex(60, 20);
vertex(70, 75);
vertex(80, 20);
endShape();
```



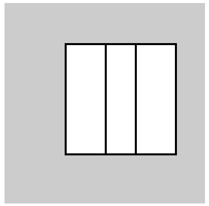
```
beginShape(TRIANGLE_STRIP);
vertex(30, 75);
vertex(40, 20);
vertex(50, 75);
vertex(60, 20);
vertex(70, 75);
vertex(80, 20);
vertex(90, 75);
endShape();
```



```
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();
```

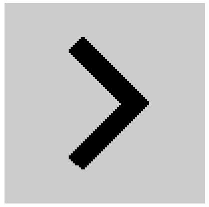


```
beginShape(QUADS);
vertex(30, 20);
vertex(30, 75);
vertex(50, 75);
vertex(50, 20);
vertex(65, 20);
vertex(65, 75);
vertex(85, 75);
vertex(85, 20);
endShape();
```

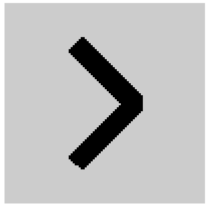


```
beginShape(QUAD_STRIP);
vertex(30, 20);
vertex(30, 75);
vertex(50, 20);
vertex(50, 75);
vertex(65, 20);
vertex(65, 75);
vertex(85, 20);
vertex(85, 75);
endShape();
```

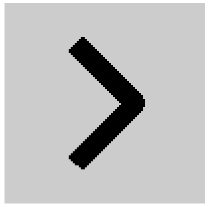
strokeJoin()



```
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

OpenProcessing

http://www.openprocessing.org/

- Bryn Mawr and SMU student sketches