Review

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

`random(high);`
`random(low, high);`

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

`mouseX`
`mouseY`

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

`print( something );`
`println( something );`

Print something to the Processing console.

```
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 the draw loop

`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 );
```

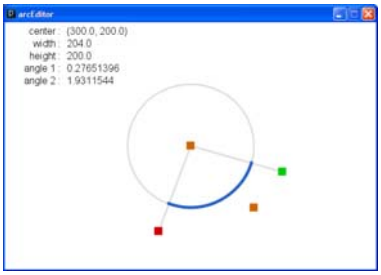
An arc is a section of an ellipse

`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 );
```



Spline Curves

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

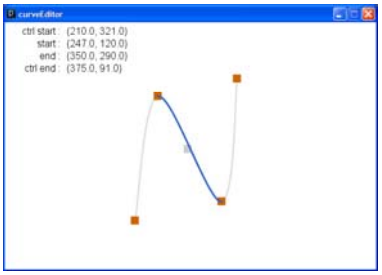
Spline: A smooth line drawn through a series of points
A curve is a Catmull-Rom (cubic Hermite) spline defined by four points

`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 );
```



Bézier Curves

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

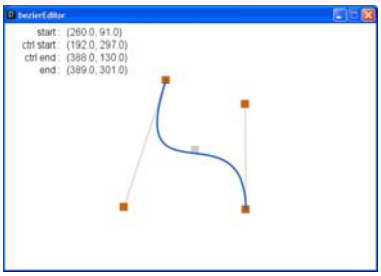
A smooth curve defined by two anchor points and two control points

`x1, y1` *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 );
```

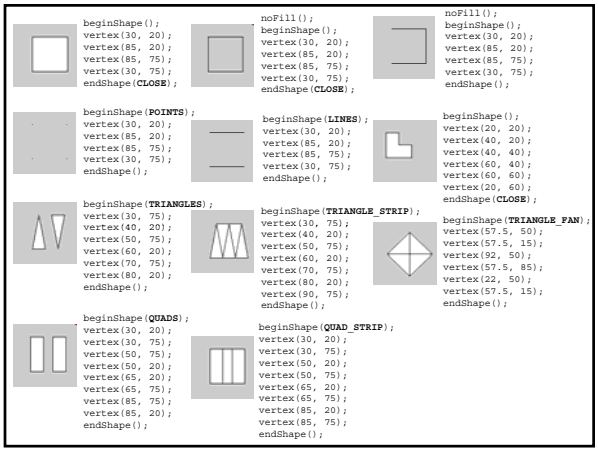


Custom Shapes

- 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, curves, or bézier splines
- Shape 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();
```

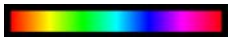
More Color

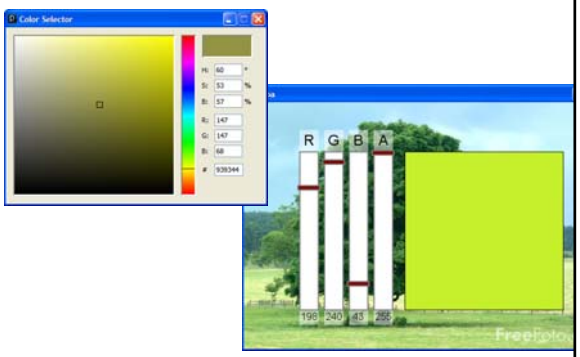
```
colorMode(RGB or HSB);
```

RGB: (red, green, blue)

HSB:

- hue
  - "pure color"
- saturation
  - "intensity"
- brightness
  - "lightness"





```
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 a 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 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				

Example Sketches...

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

OpenProcessing

http://www.openprocessing.org/

- Bryn Mawr and SMU student sketches