Drawing Using HTML5 Canvas

- Go to http://o.ooli.ca/canvasjsbin
- *Presentation copy http://*













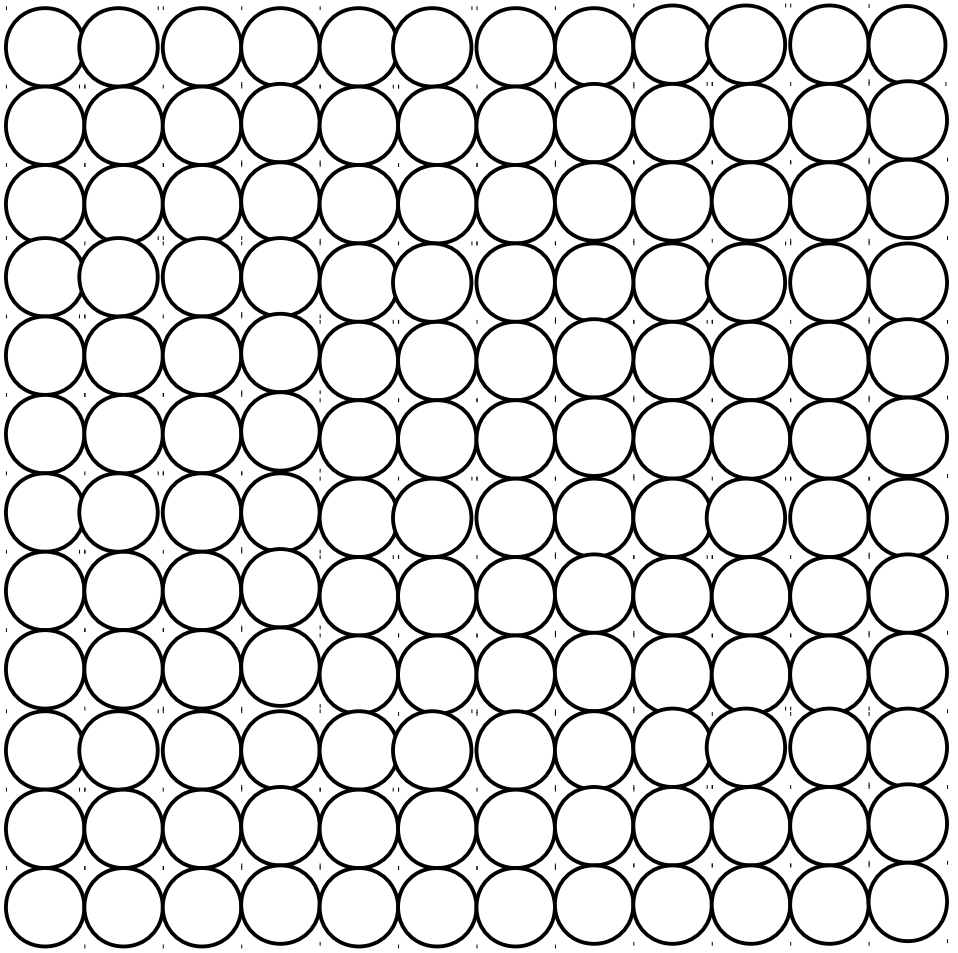

Overview

- Main Topics
  - Lines 
  - Color 
  - Shapes 
  - Images 

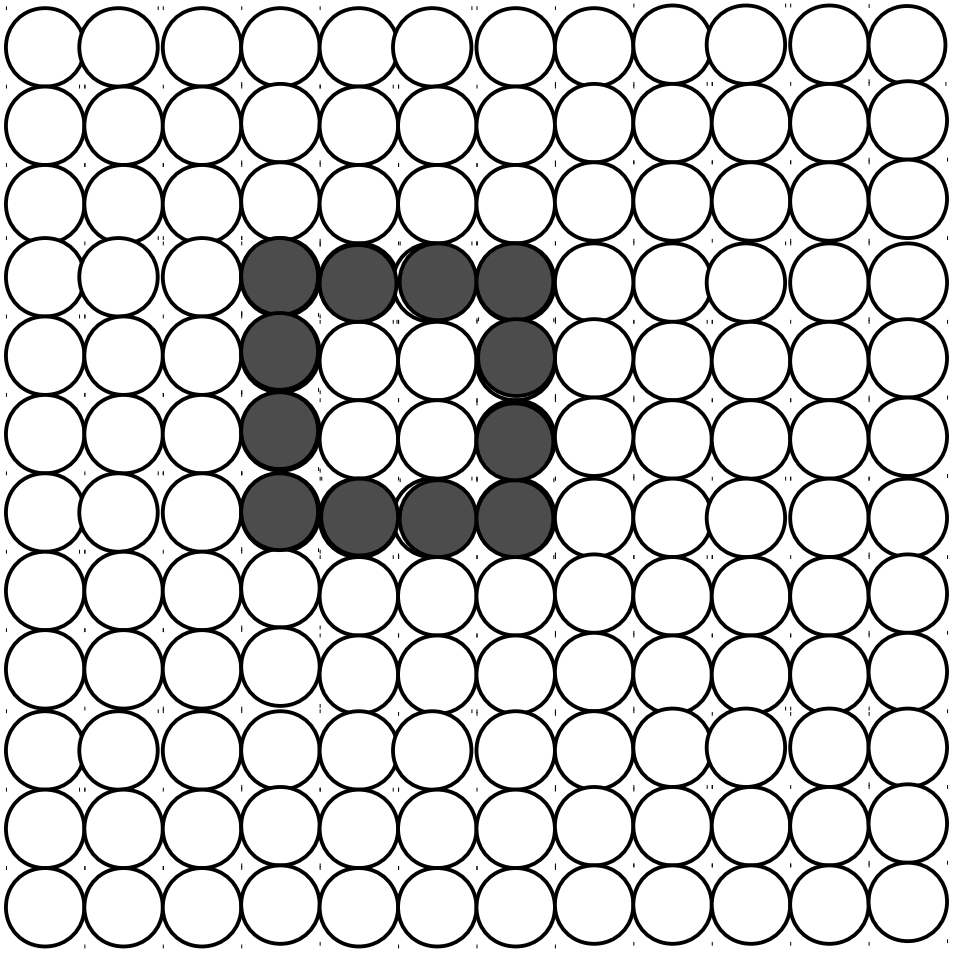
- Optional
  - Curves 
  - Bezier curves 
  - Text

ADVANCED

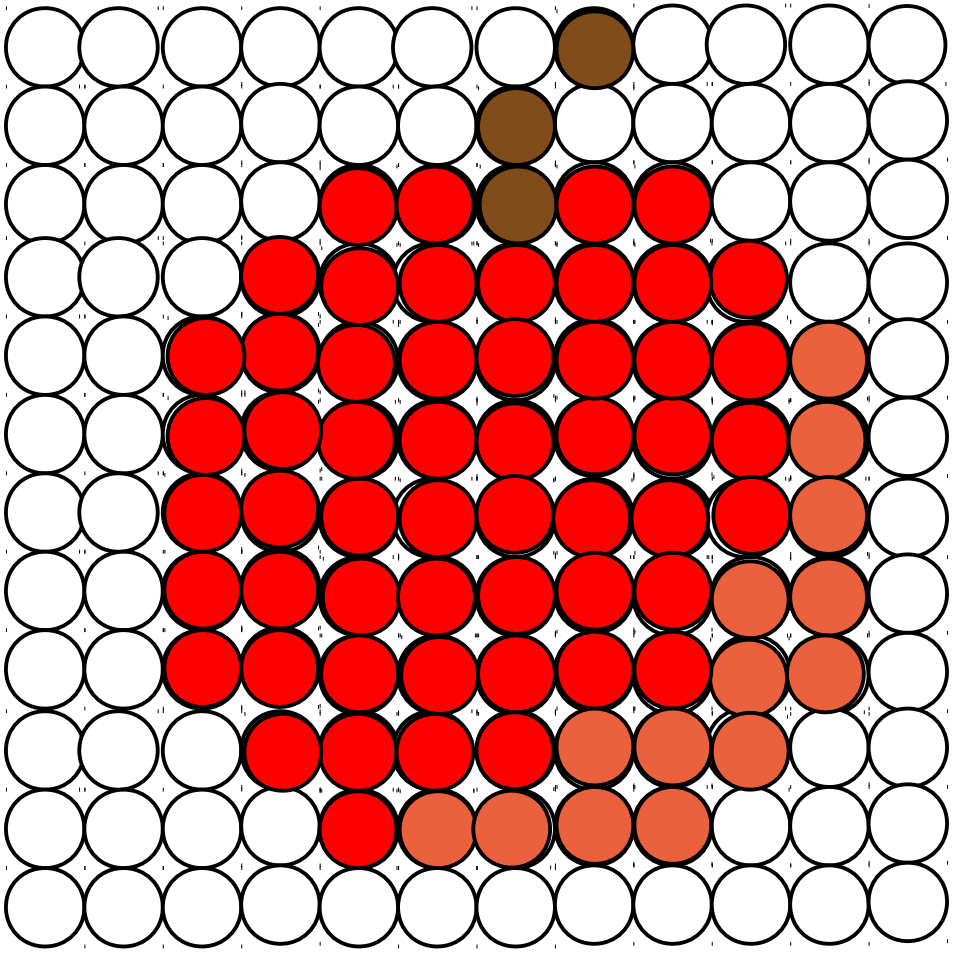
Computer screens = dots



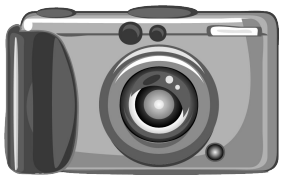
Change colors of the dots to make pictures



Change colors of the dots to make pictures



Dots = pixels

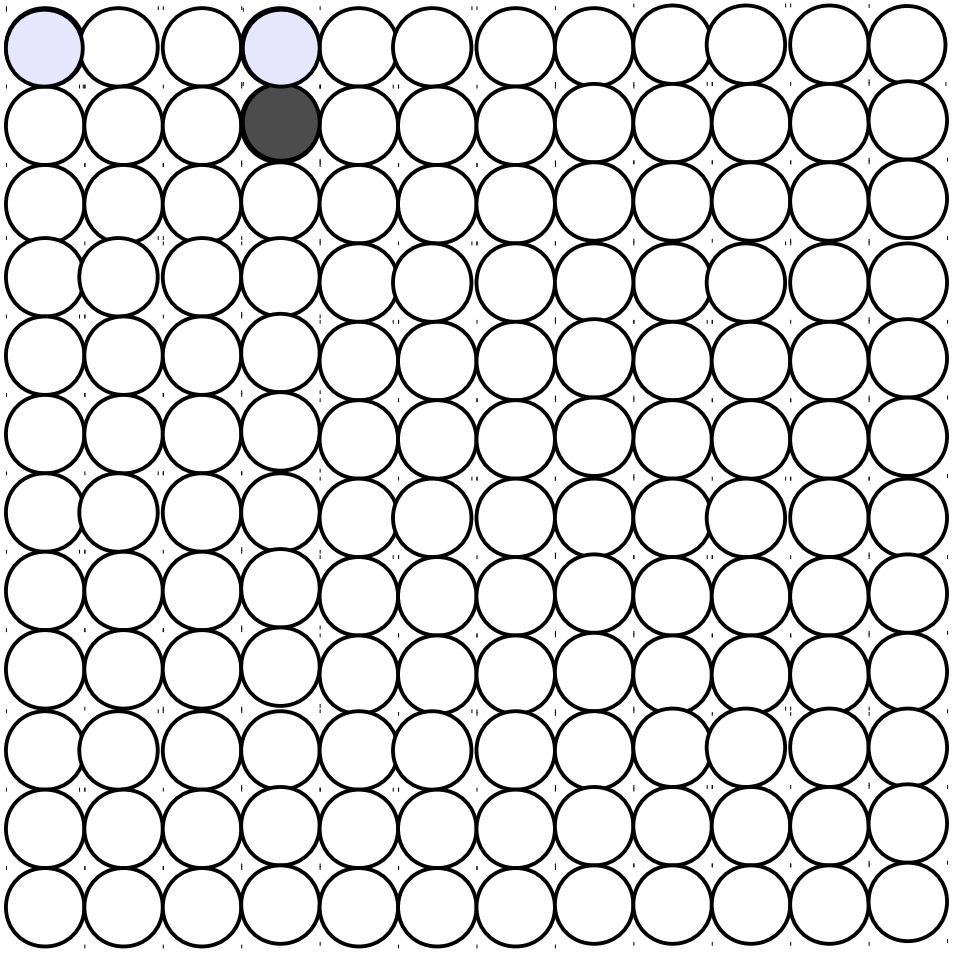


8 megapixels

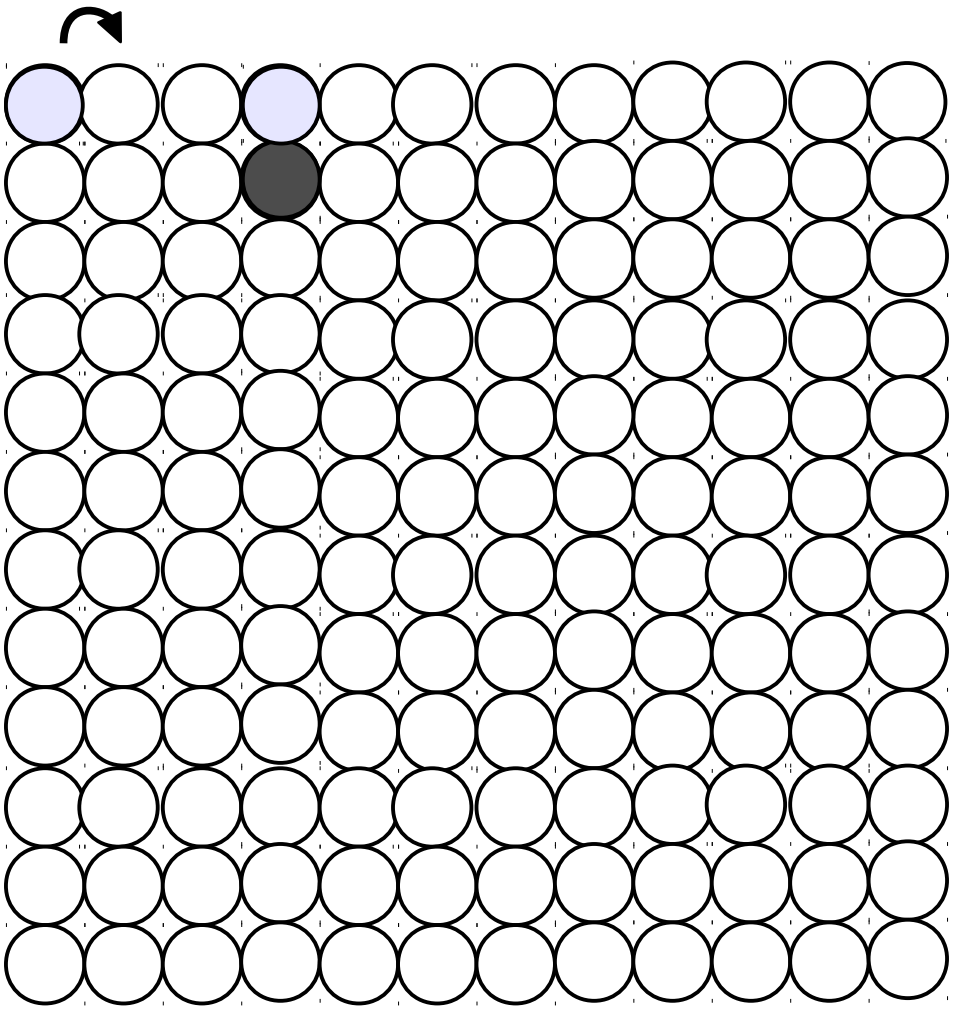
800 x 480

720p HD

Where is the dot?



Where is the dot?



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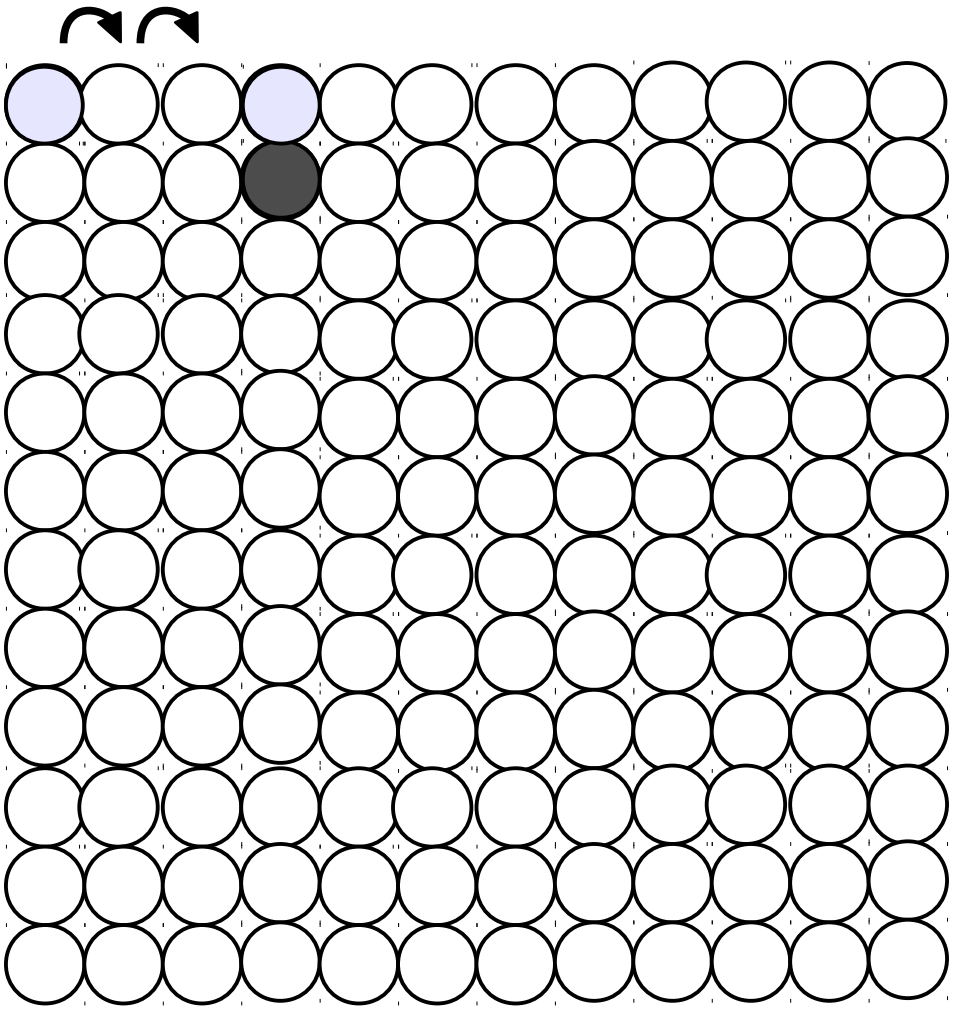

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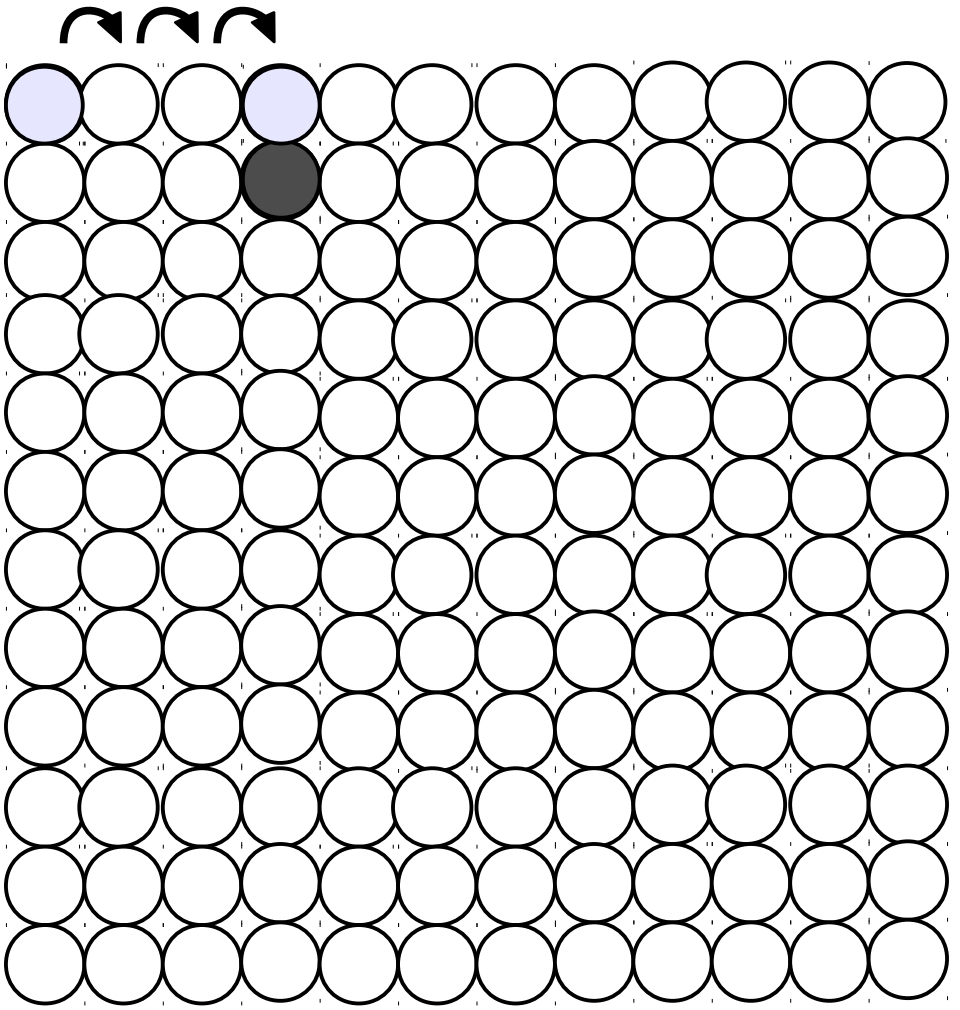

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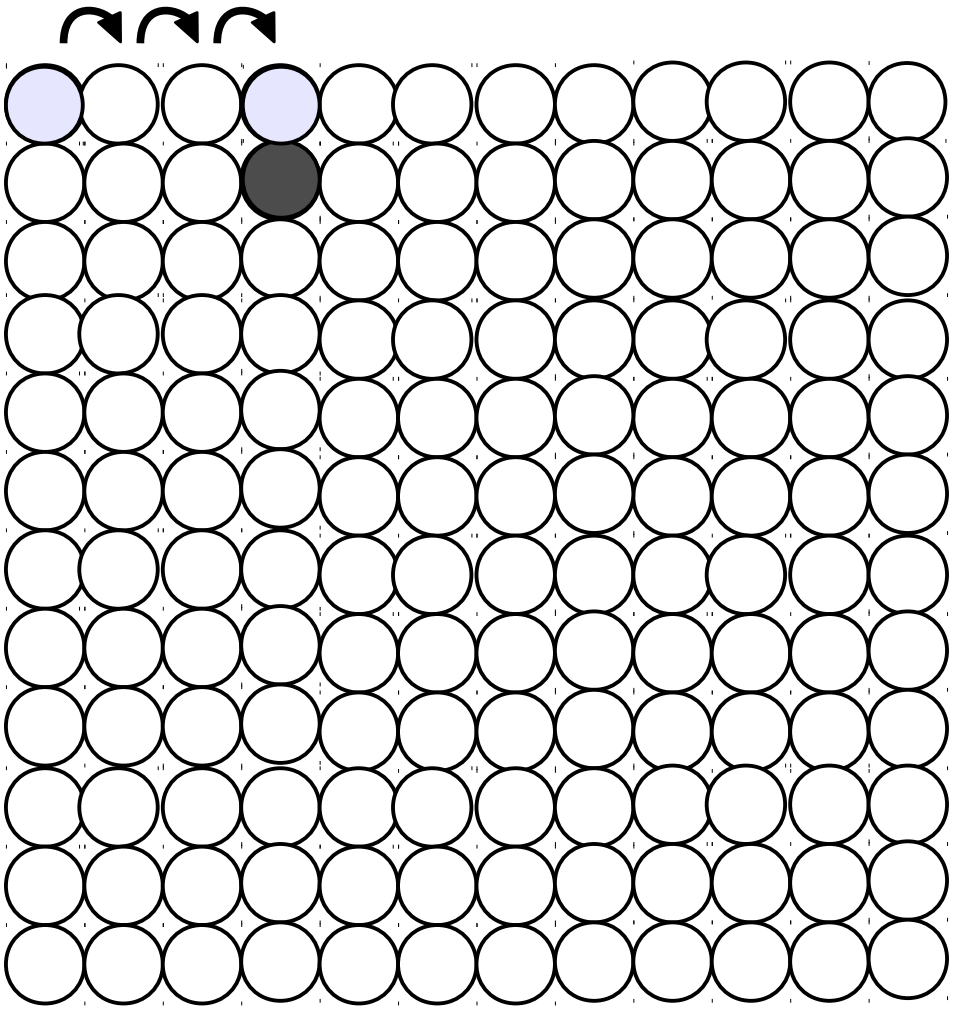
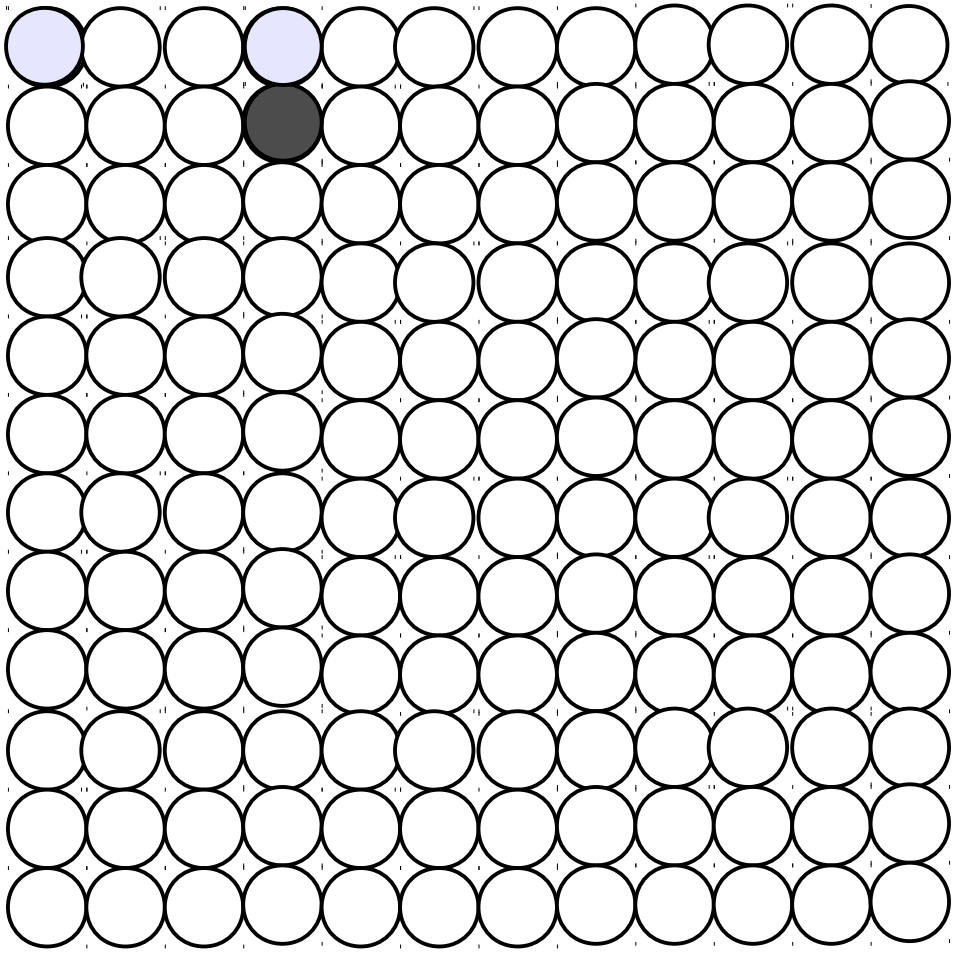


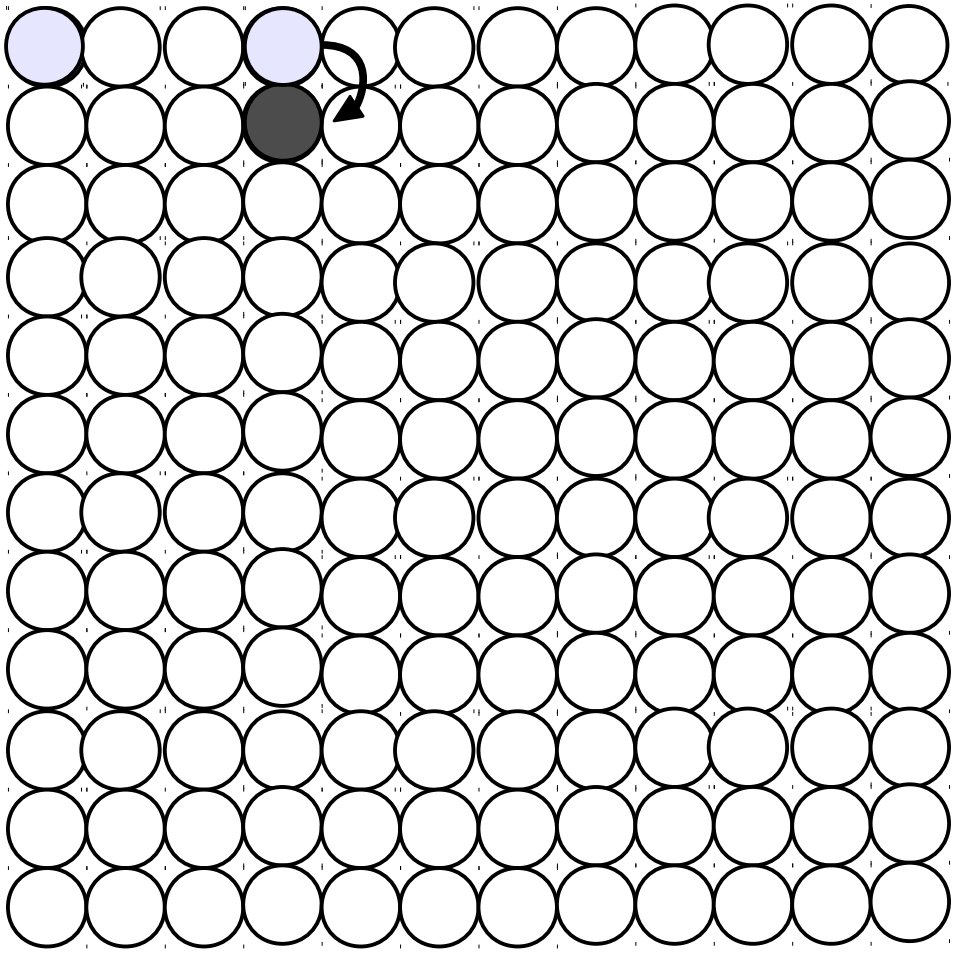
3

Where is the dot?



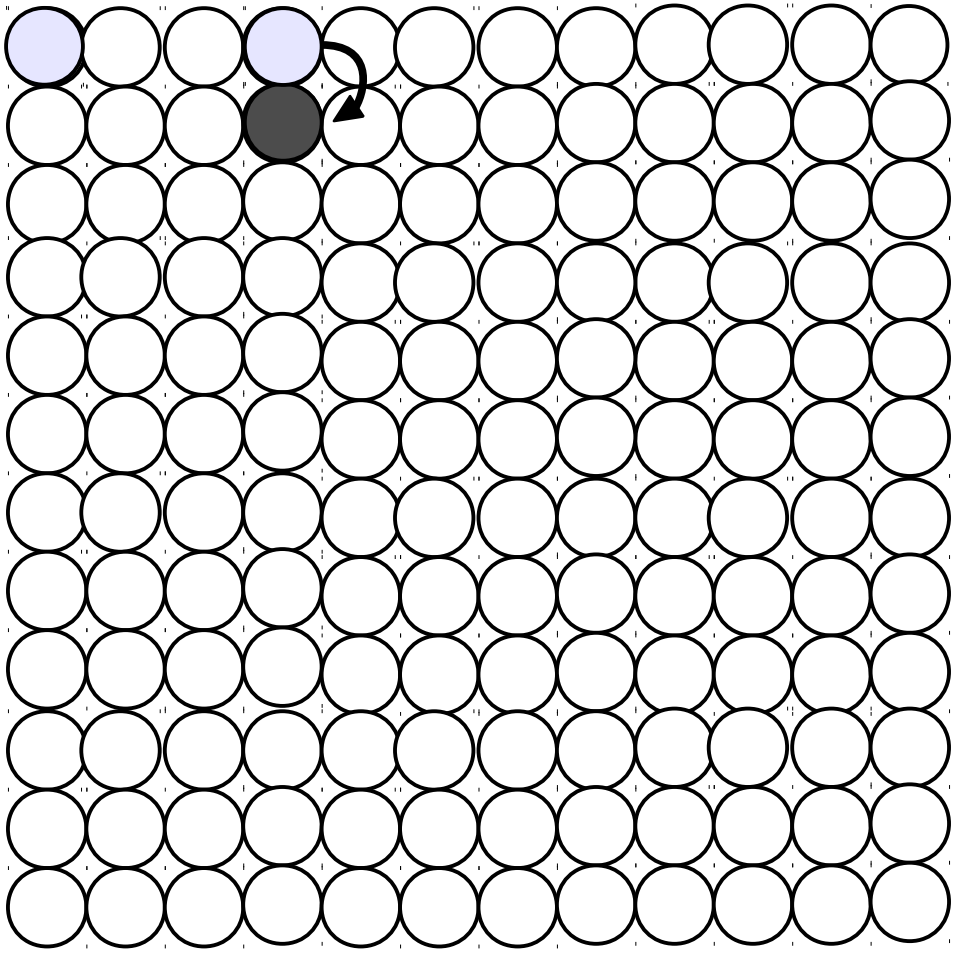
3

Where is the dot?



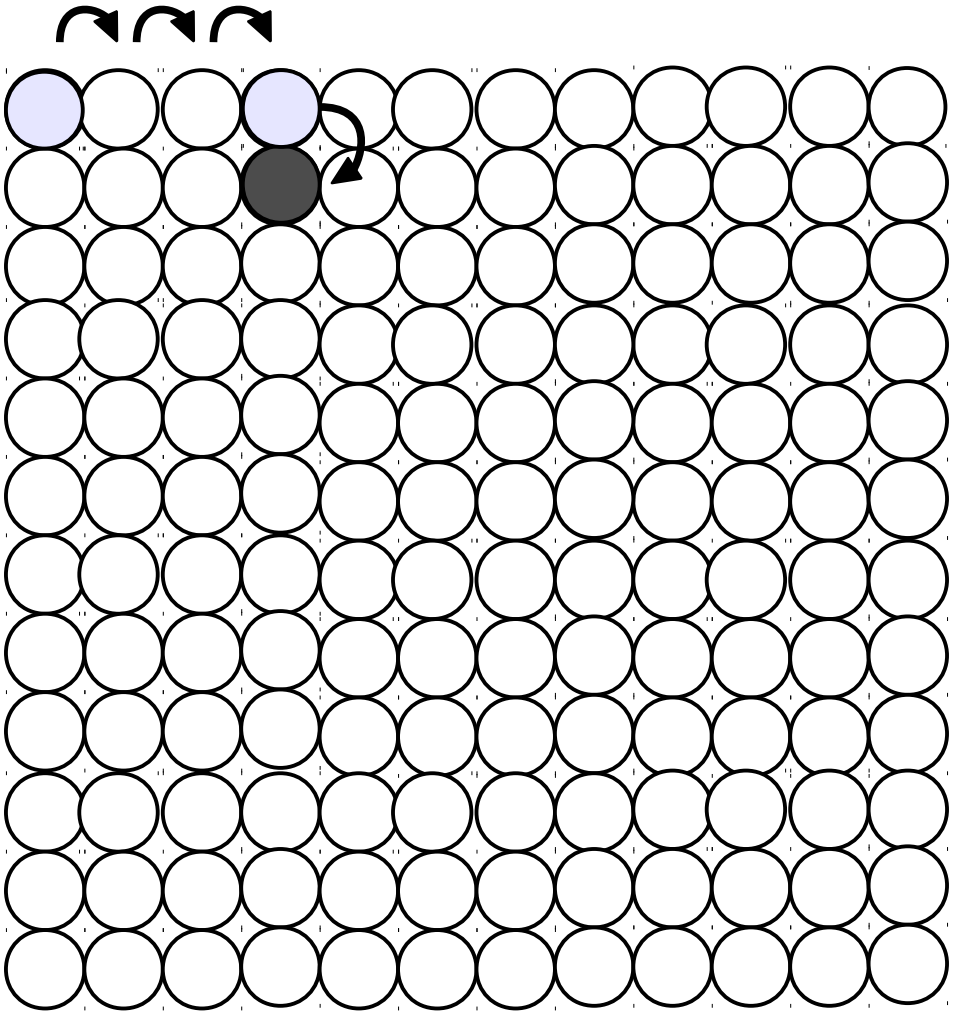
3

Where is the dot?



3, 1

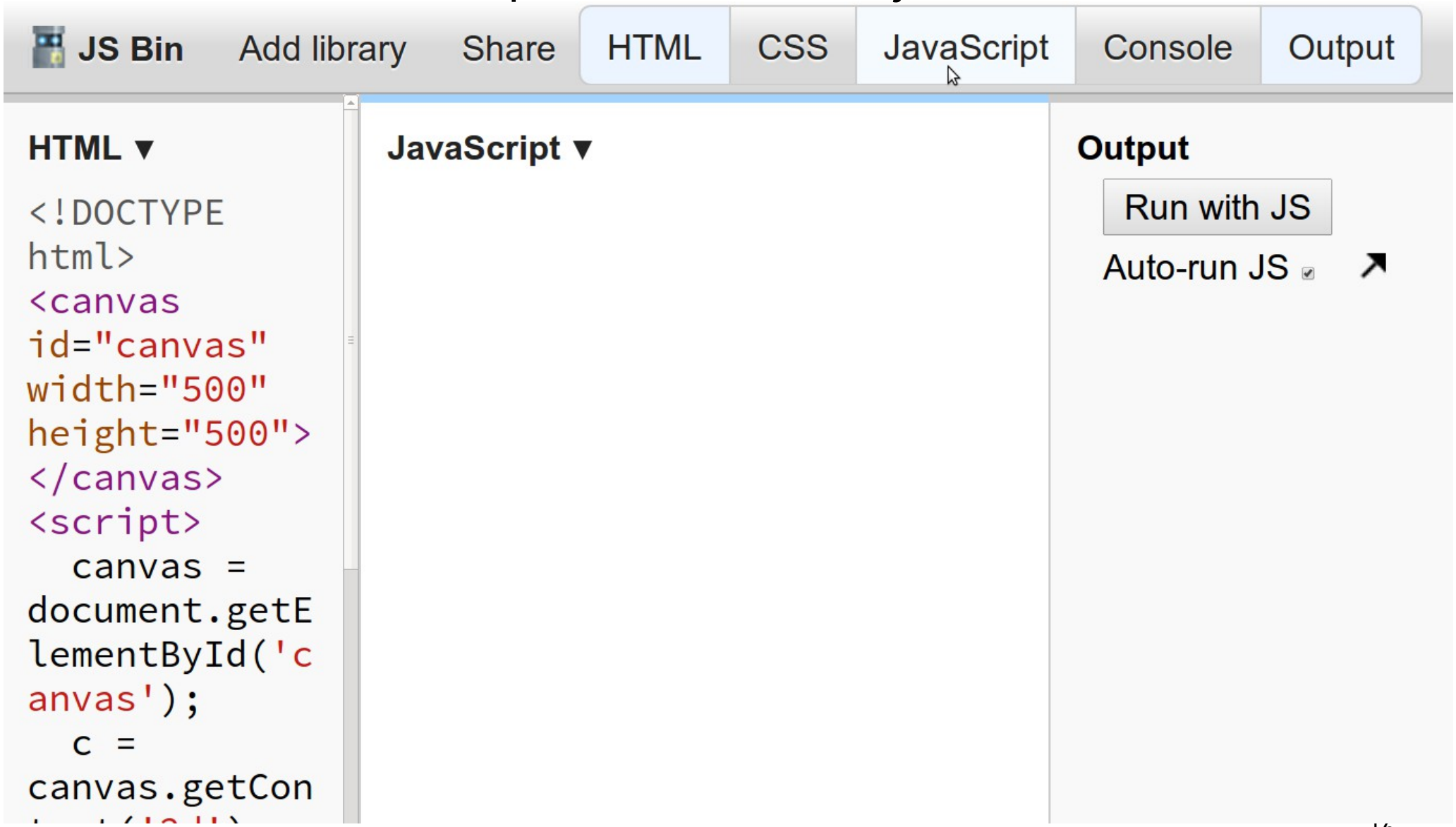
Math it up!



x	y
3,	1

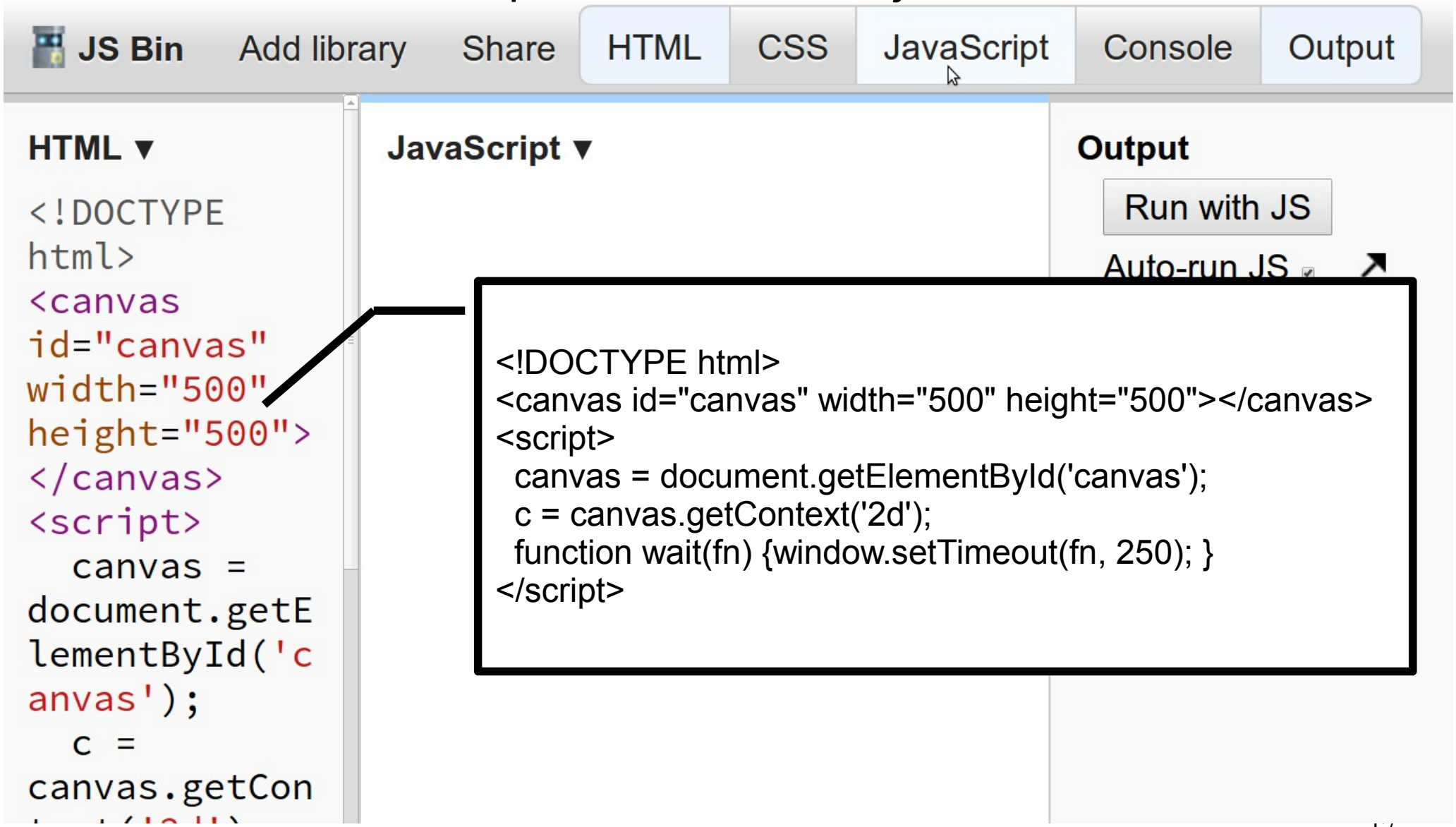
Let's Start Programming: jsbin

http://o.ooli.ca/canvasjsbin



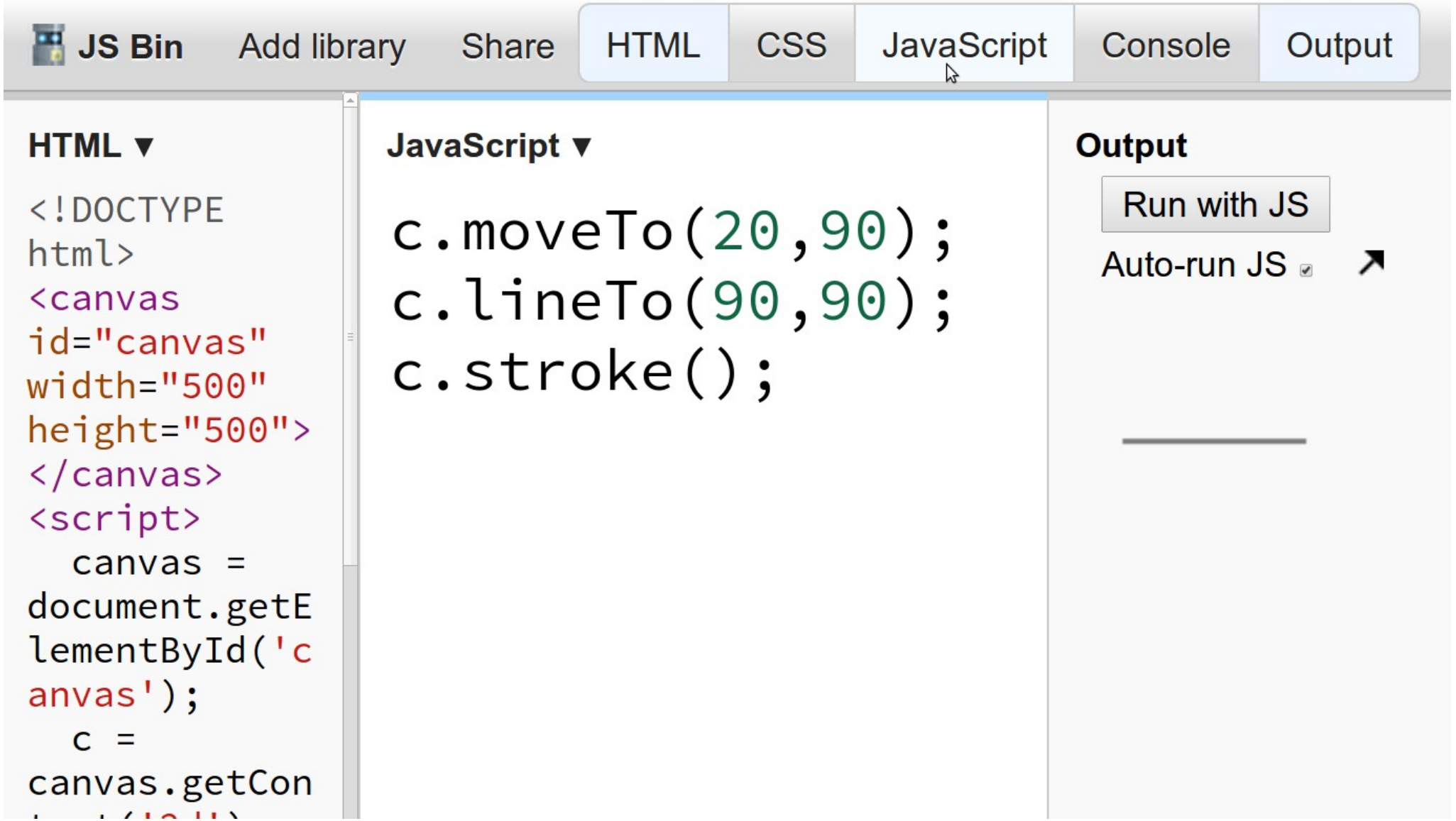
jsbin

http://o.ooli.ca/canvasjsbin



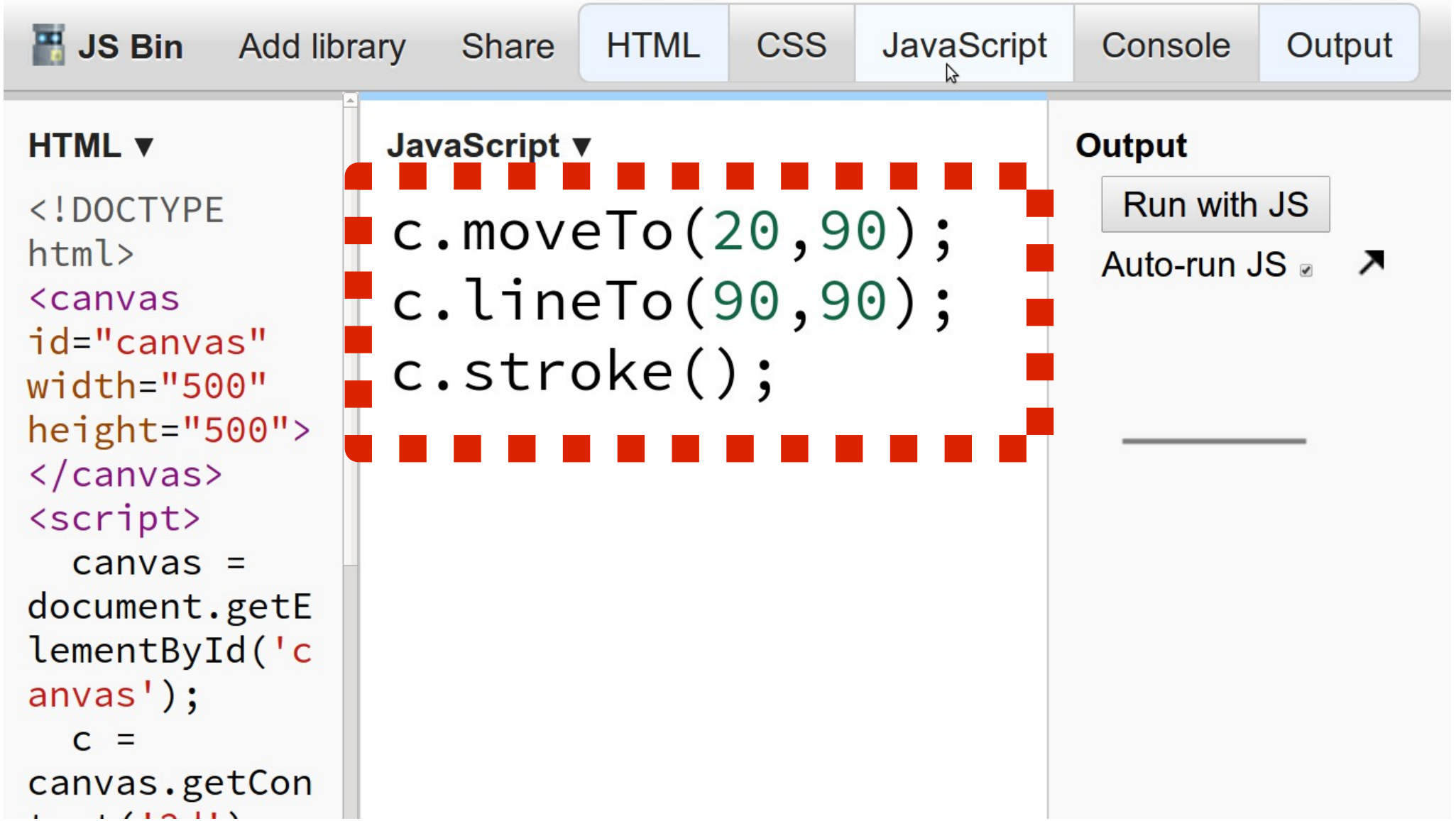
Let's Draw Something

http://o.ooli.ca/canvasjsbin



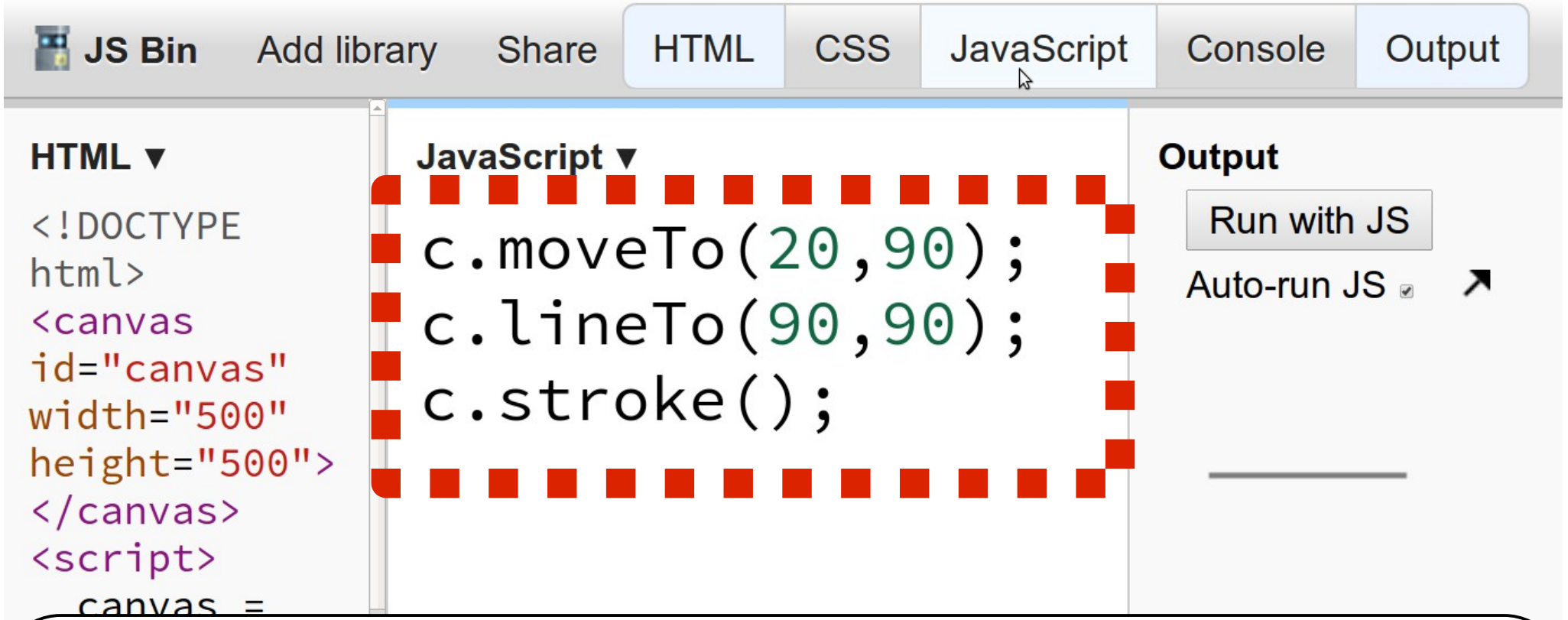
Let's Draw Something

http://o.ooli.ca/canvasjsbin

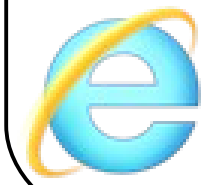


Let's Draw Something

http://o.ooli.ca/canvasjsbin



Checking for Errors



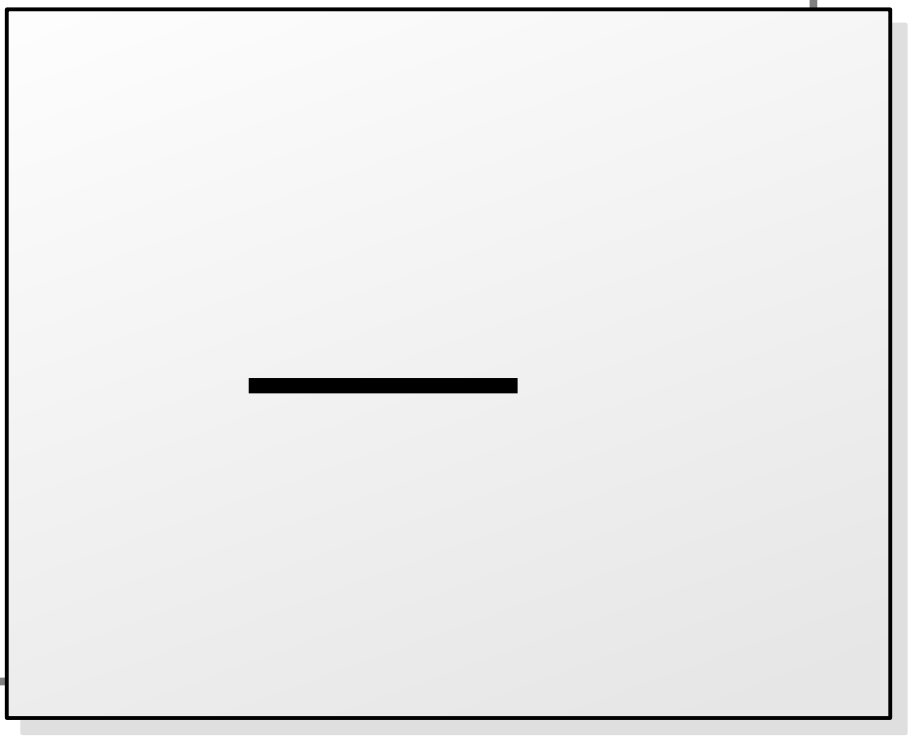
F12

ctrl - shift⇧ J

cmd⌘ - option⌥alt - C

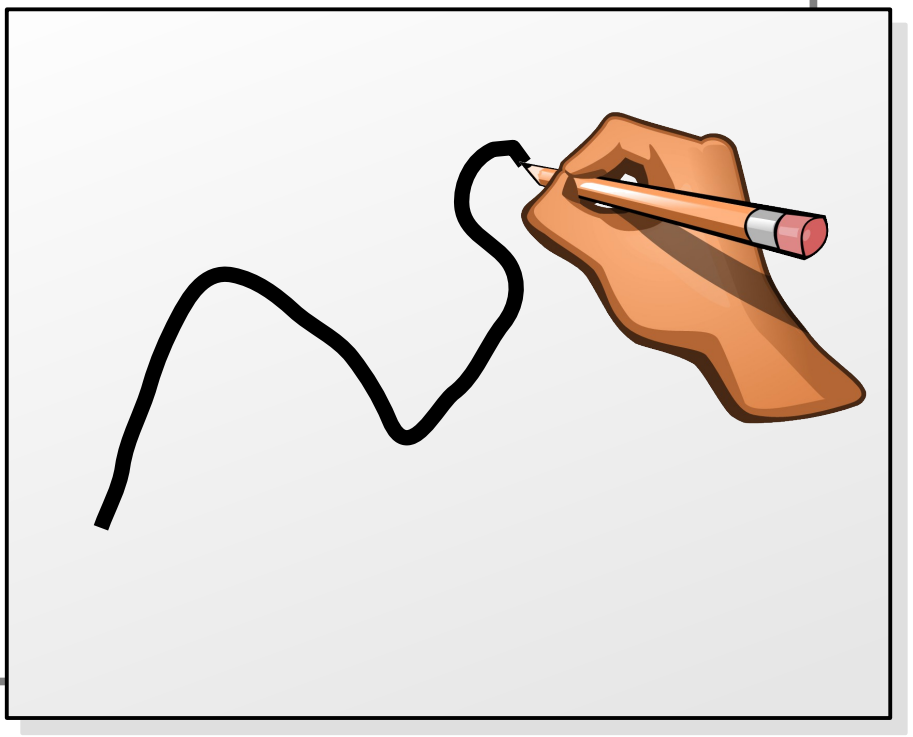
What's Going On?

```
c.moveTo(20,90);
c.lineTo(90,90);
c.stroke();
```



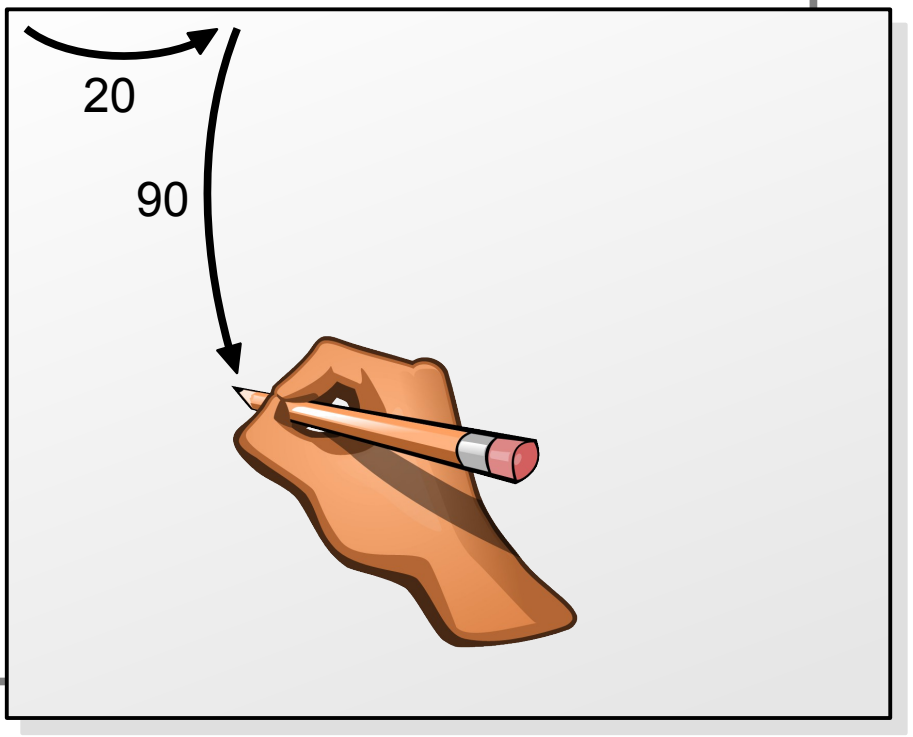
Canvas

```
c.moveTo(20,90);
c.lineTo(90,90);
c.stroke();
```



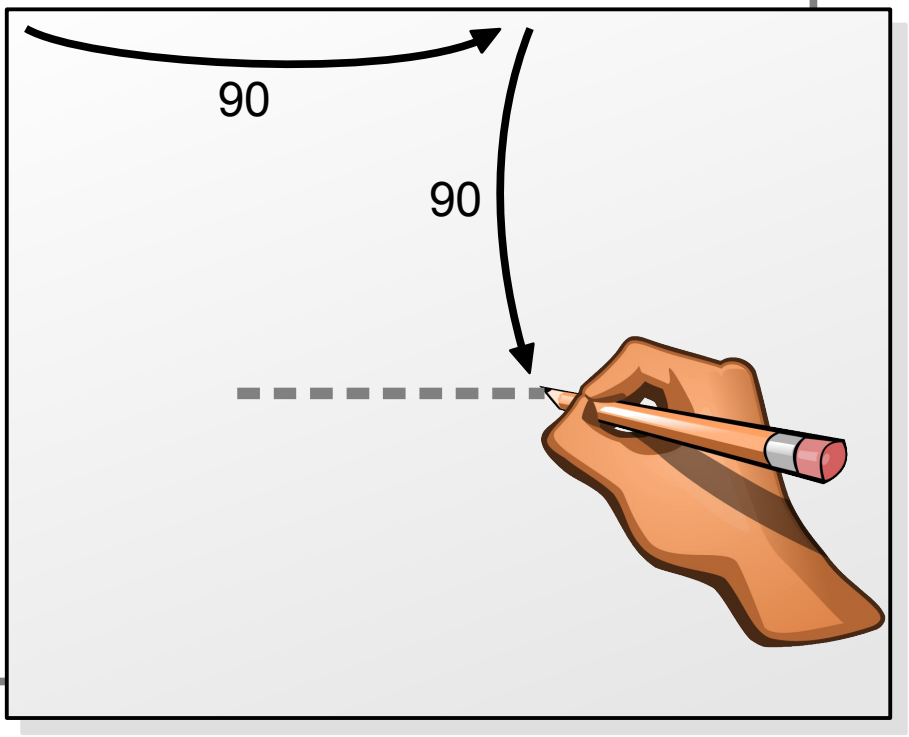
Move Pen

```
c.moveTo(20,90);
c.lineTo(90,90);
c.stroke();
```



Tell Computer Where You Want a Line

```
c.moveTo(20,90);
c.lineTo(90,90);
c.stroke();
```

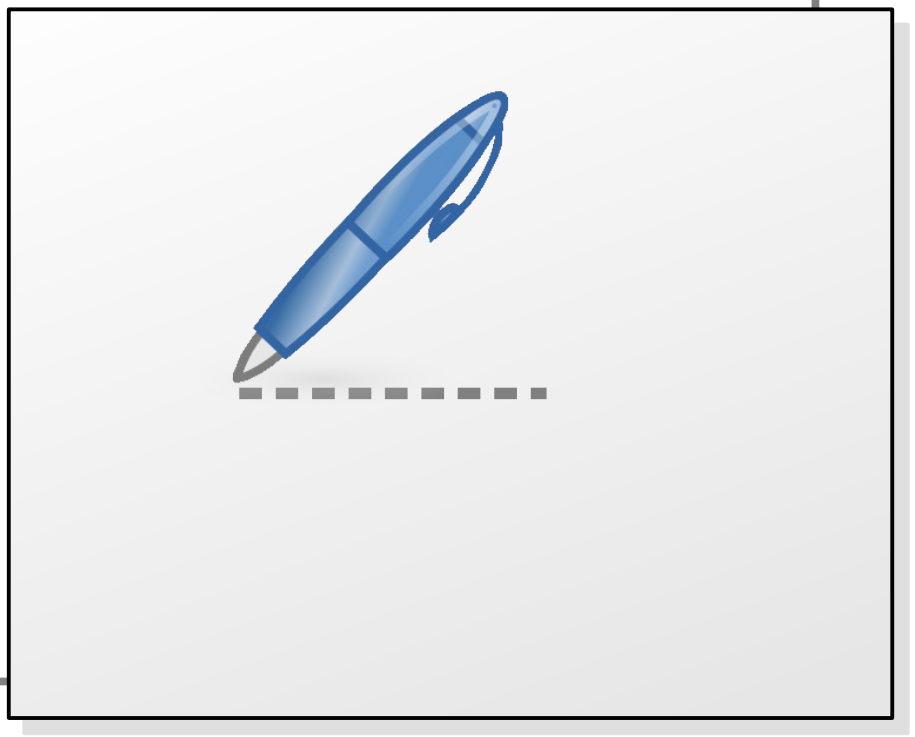


Tell Computer to Draw the Line

```
c.moveTo(20,90);
c.lineTo(90,90);
c.stroke();
```

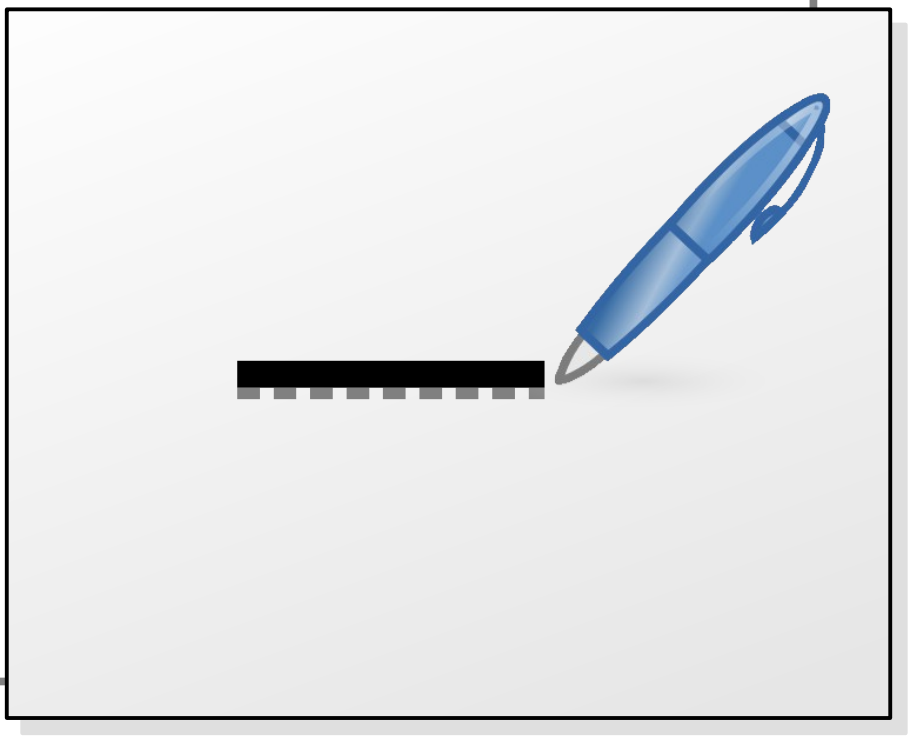
Tell Computer to Draw the Line

```
c.moveTo(20,90);
c.lineTo(90,90);
c.stroke();
```



Tell Computer to Draw the Line

```
c.moveTo(20,90);
c.lineTo(90,90);
c.stroke();
```



Make Your Own Picture

JS Bin Add library Share HTML CSS JavaScript Console Output

HTML ▼

```
<!DOCTYPE
html>
<canvas
id="canvas"
width="500"
height="500">
</canvas>
<script>
  canvas =
document.getE
lementById('c
anvas');
  c =
canvas.getCon
```

JavaScript ▼

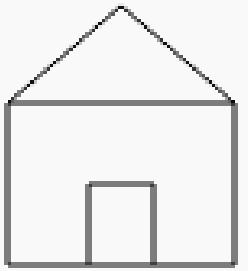
```
c.moveTo(20,90);
c.lineTo(90,90);
c.lineTo(90,140);
c.lineTo(20,140);
c.lineTo(20,90);
c.lineTo(55,60);
c.lineTo(90,90);

c.moveTo(45,140);
c.lineTo(45,115);
c.lineTo(65,115);
c.lineTo(65,140);
c.stroke();
```

Output

Run with JS

Auto-run JS



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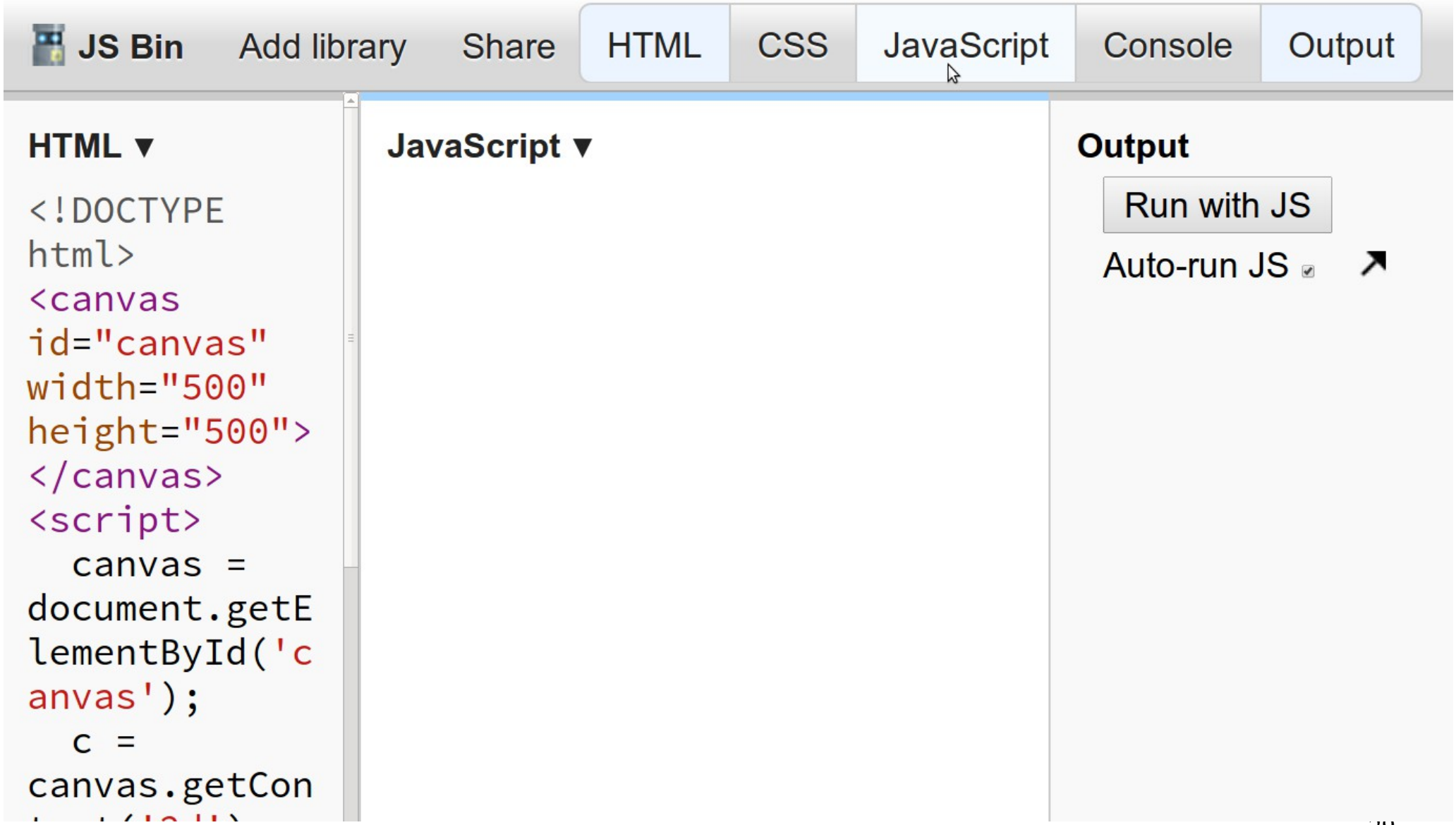

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JavaScript ▾

```
c.moveTo(20,90);
```

Output

Run with JS

Auto-run JS

Make Your Own Picture

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```

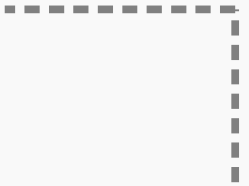
JavaScript ▼

```
c.moveTo(20,90);
c.lineTo(90,90);
c.lineTo(90,140);
```

Output

Run with JS

Auto-run JS



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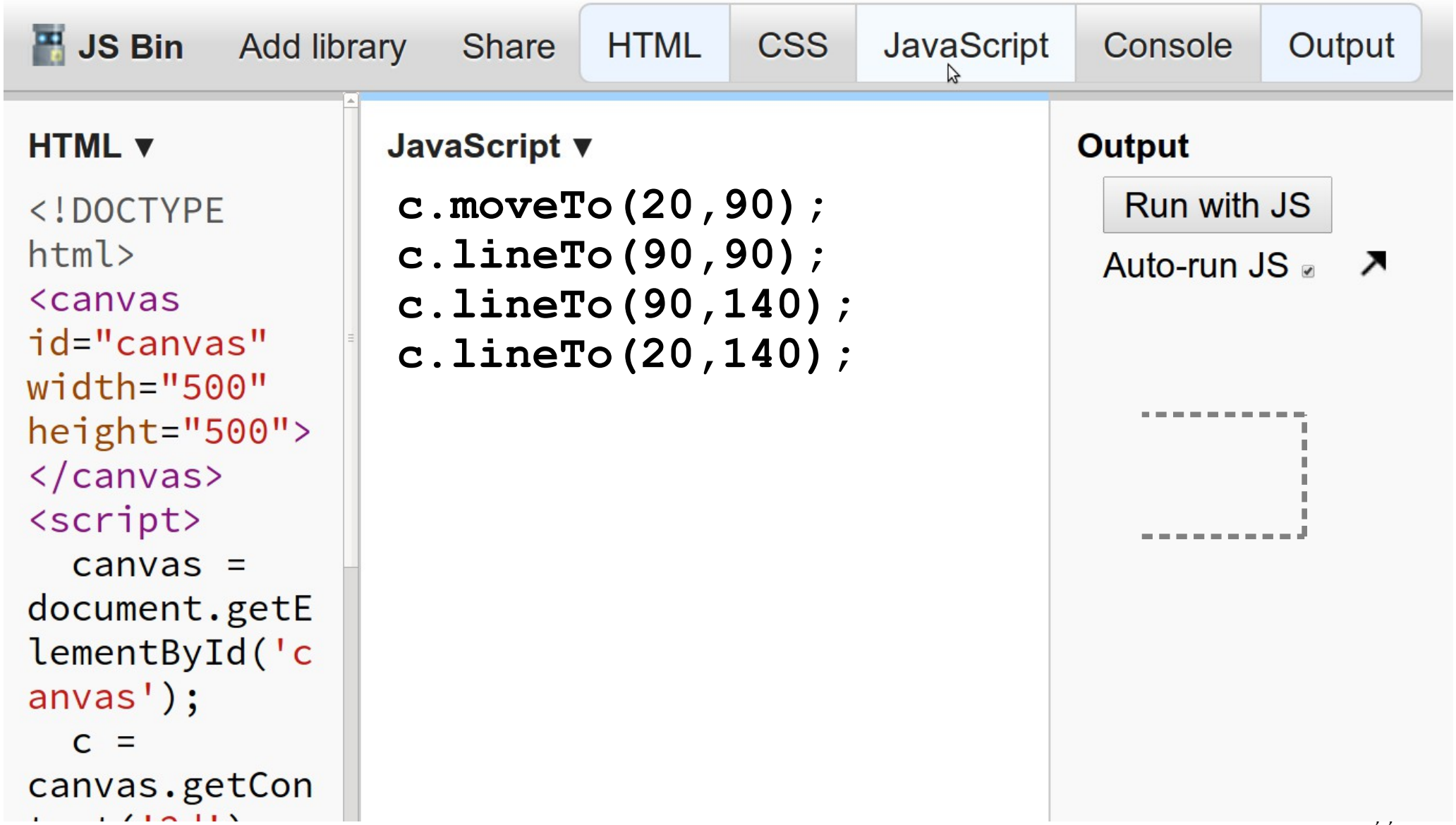

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JavaScript ▼

```
c.moveTo(20,90);
c.lineTo(90,90);
c.lineTo(90,140);
c.lineTo(20,140);
c.lineTo(20,90);
```

Output

Run with JS

Auto-run JS

Make Your Own Picture

JS Bin Add library Share HTML CSS JavaScript Console Output

HTML ▾

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```

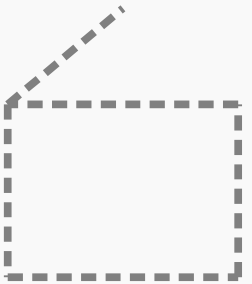
JavaScript ▾

```
c.moveTo(20,90);
c.lineTo(90,90);
c.lineTo(90,140);
c.lineTo(20,140);
c.lineTo(20,90);
c.lineTo(55,60);
```

Output

Run with JS

Auto-run JS



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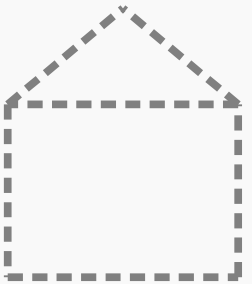
c.lineTo(90,140);
c.lineTo(20,140);
c.lineTo(20,90);
c.lineTo(55,60);
c.lineTo(90,90);
```

Output

Run with JS

Auto-run JS



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JavaScript ▼

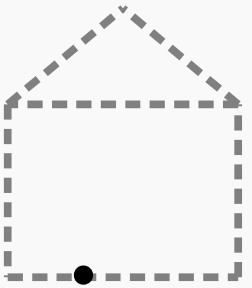
```
c.moveTo(20,90);
c.lineTo(90,90);
c.lineTo(90,140);
c.lineTo(20,140);
c.lineTo(20,90);
c.lineTo(55,60);
c.lineTo(90,90);

c.moveTo(45,140);
```

Output

Run with JS

Auto-run JS



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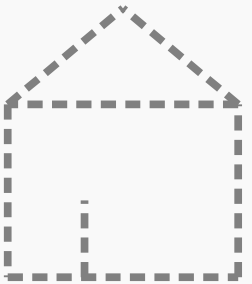
```
c.moveTo(20,90);
c.lineTo(90,90);
c.lineTo(90,140);
c.lineTo(20,140);
c.lineTo(20,90);
c.lineTo(55,60);
c.lineTo(90,90);

c.moveTo(45,140);
c.lineTo(45,115);
```

Output

Run with JS

Auto-run JS



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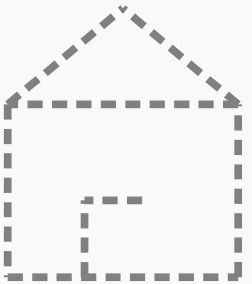
c.lineTo(45,115);
c.lineTo(65,115);
```

Output

Run with JS

Auto-run JS



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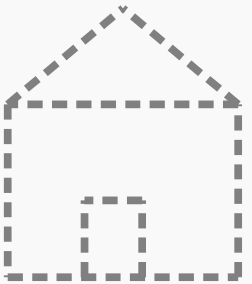
c.lineTo(55,60);
c.lineTo(90,90);

c.moveTo(45,140);
c.lineTo(45,115);
c.lineTo(65,115);
c.lineTo(65,140);
```

Output

Run with JS

Auto-run JS



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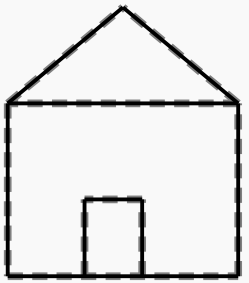
c.moveTo(20,90);
c.lineTo(90,90);
c.lineTo(90,140);
c.lineTo(20,140);
c.lineTo(20,90);
c.lineTo(55,60);
c.lineTo(90,90);

c.moveTo(45,140);
c.lineTo(45,115);
c.lineTo(65,115);
c.lineTo(65,140);
c.stroke();
```

Output

Run with JS

Auto-run JS



Drawing a Line

```
c.moveTo(20,90);
c.lineTo(90,90);
c.stroke();
```

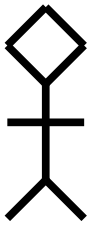
Checking for Errors

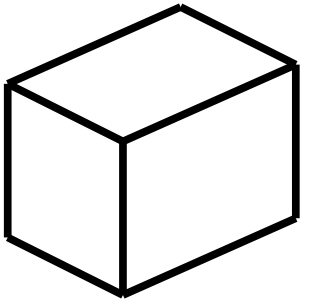
F12


ctrl - shift⇧ J

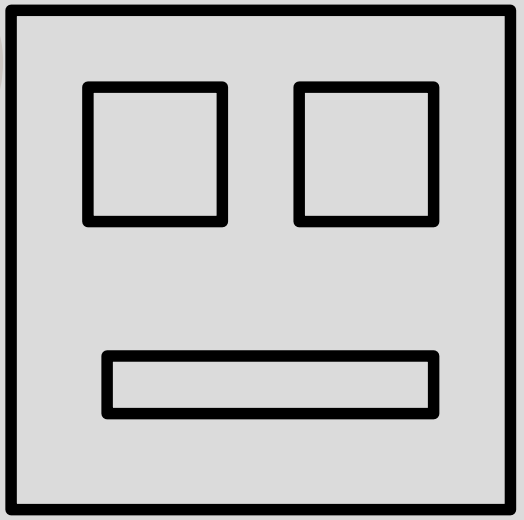
cmd⌘ - option⌥alt - C

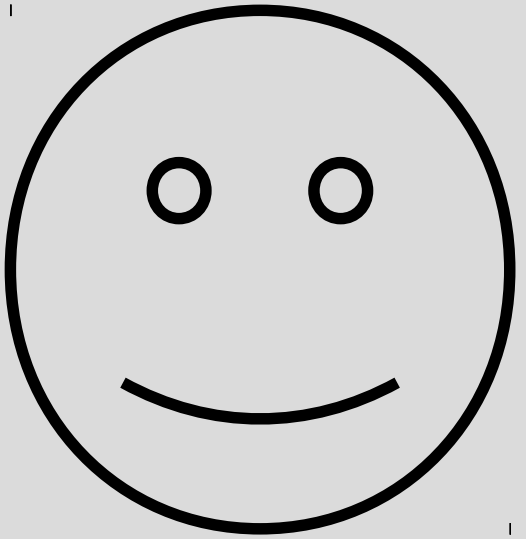
Ideas



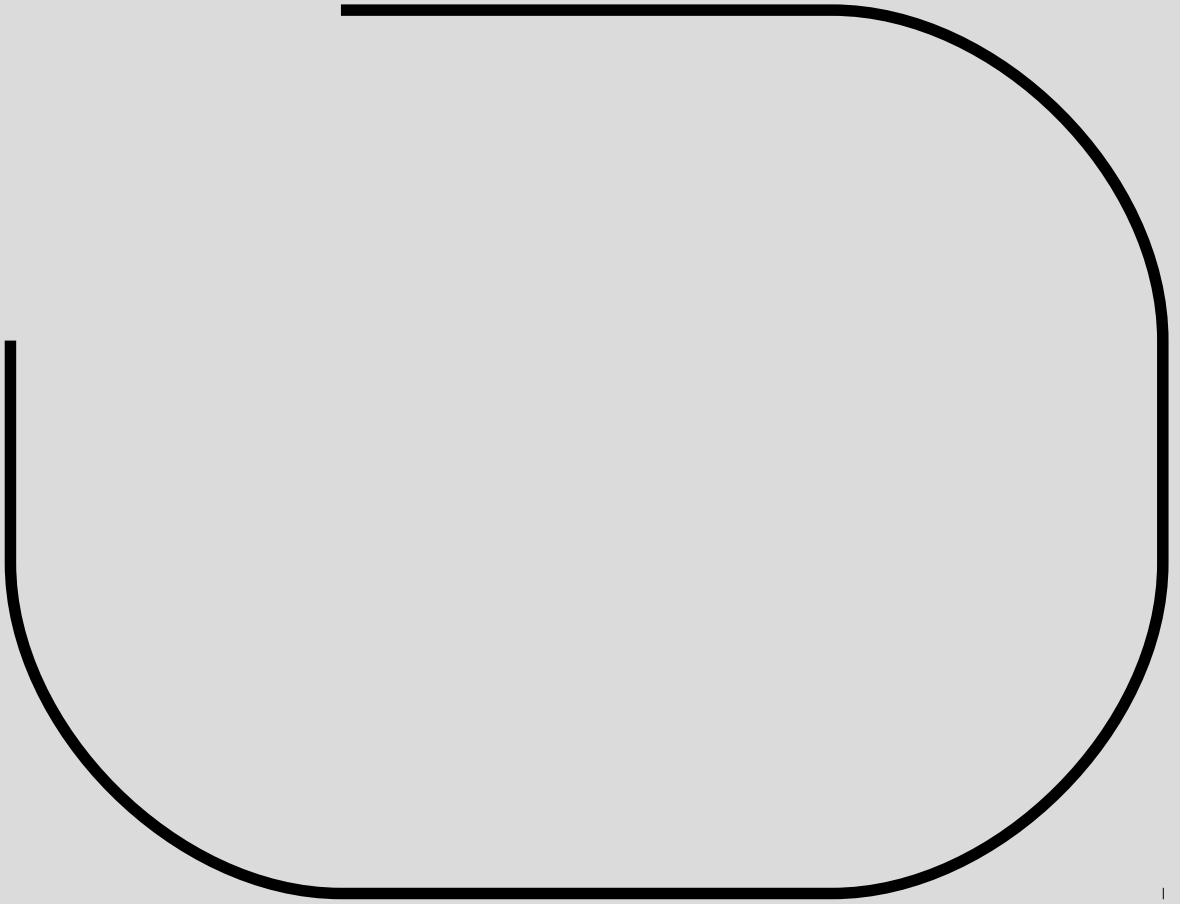


Curves

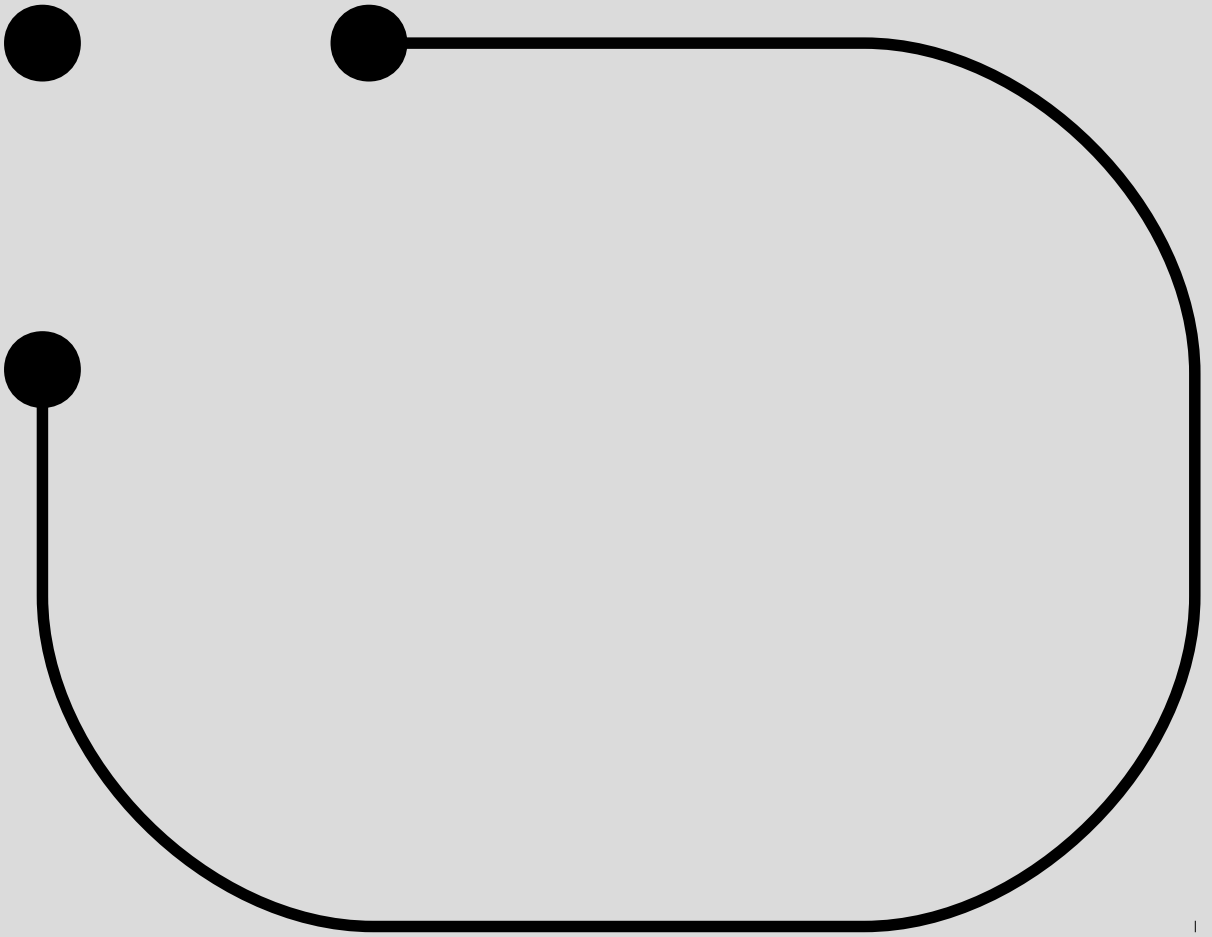




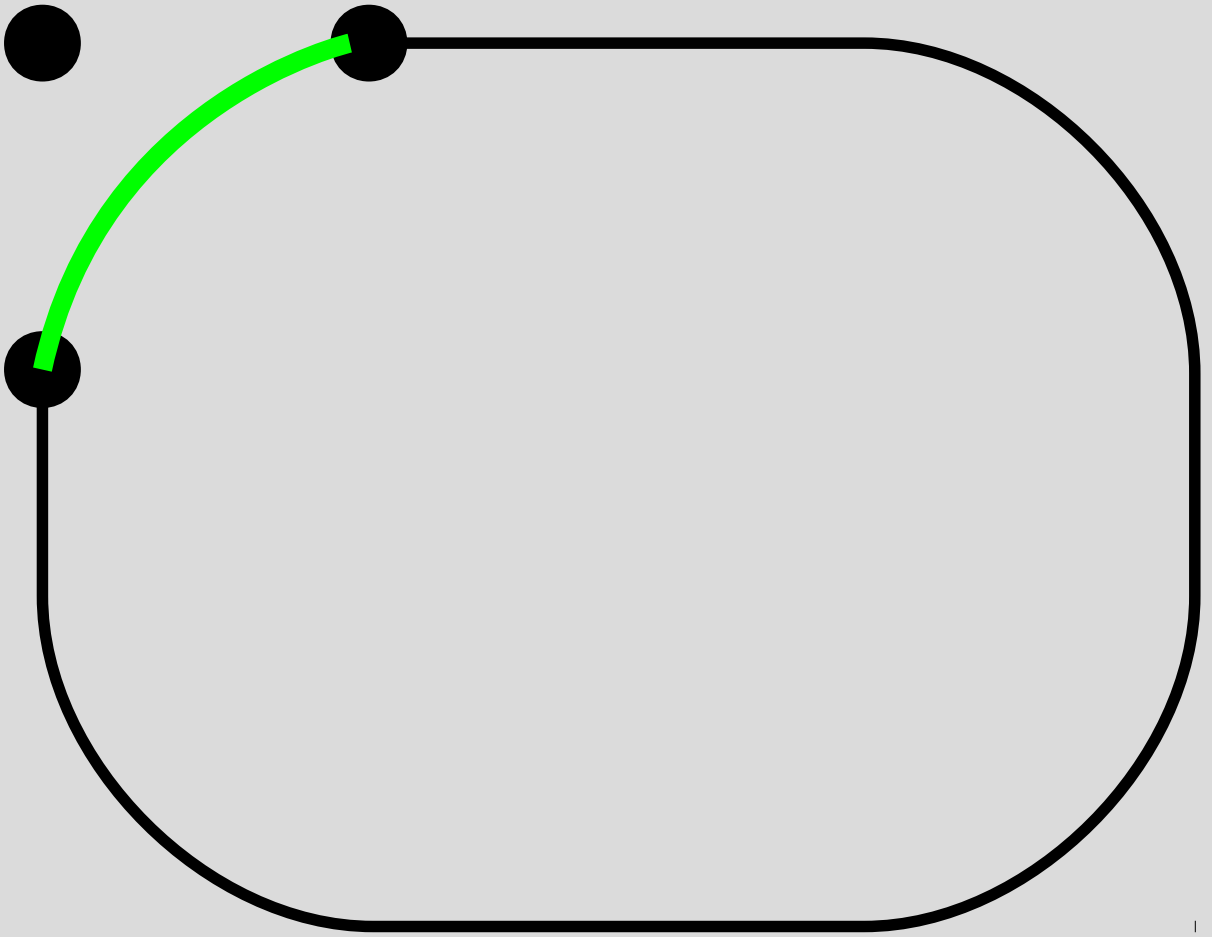
Curves



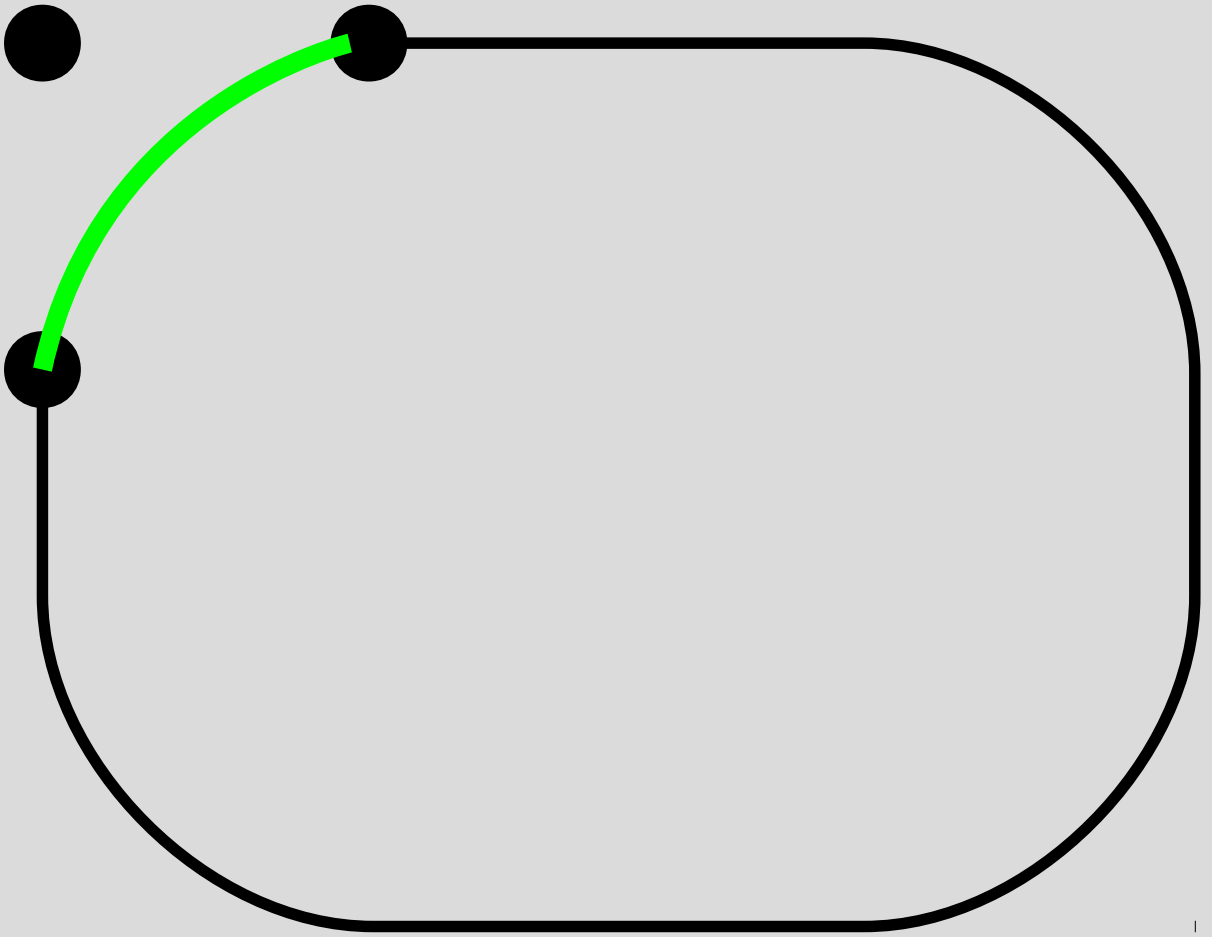
Curves



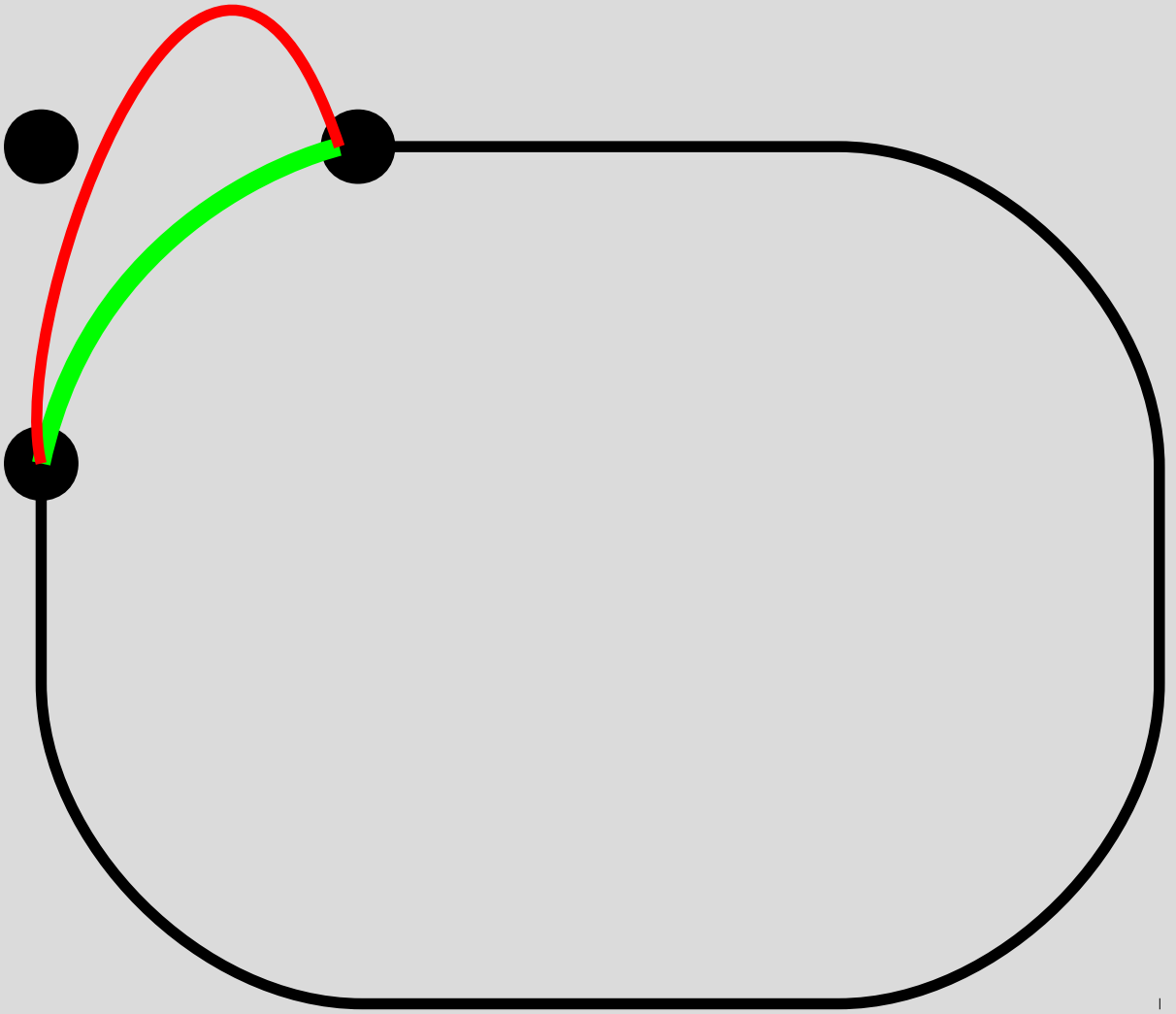
Curves



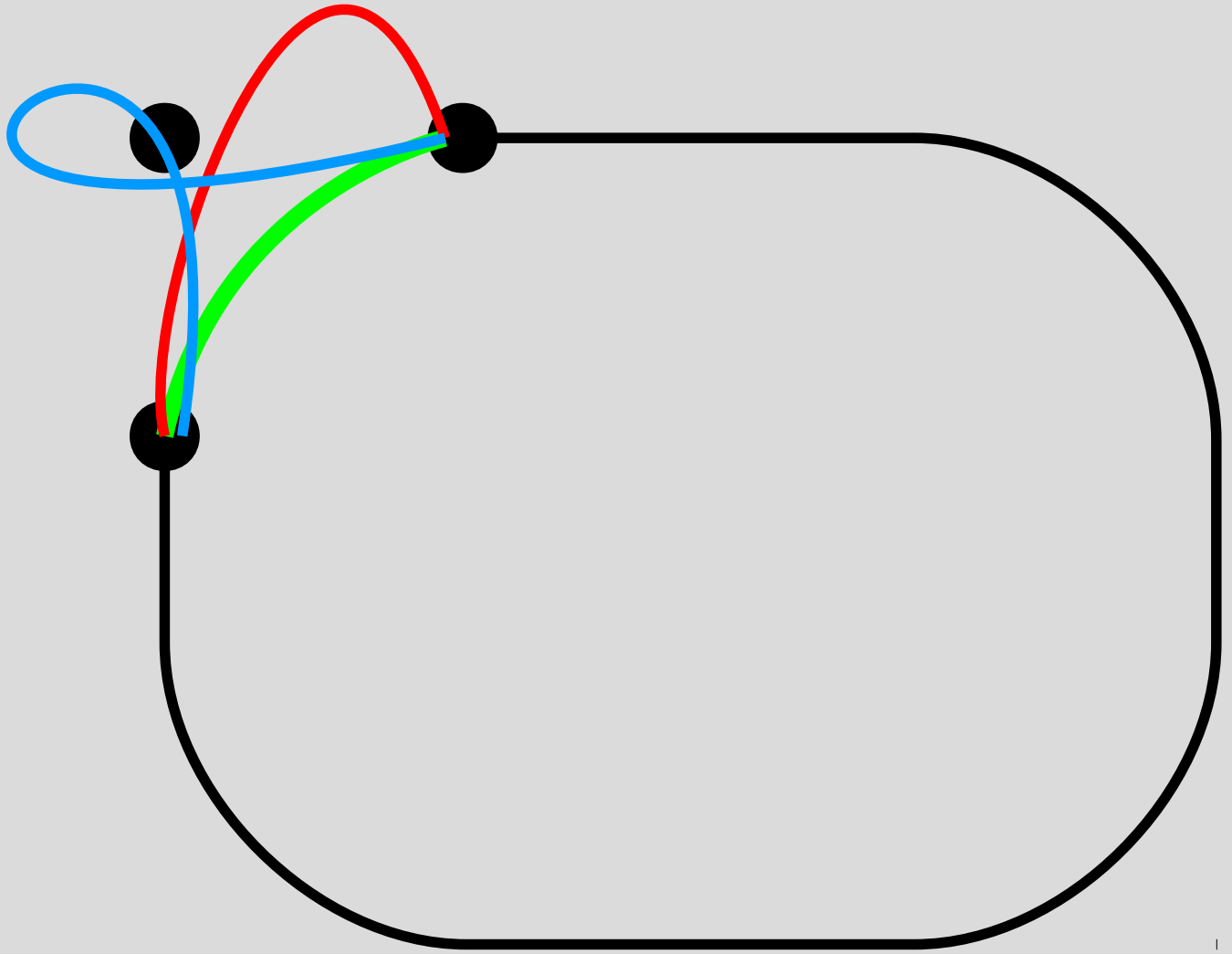
Which Curve?



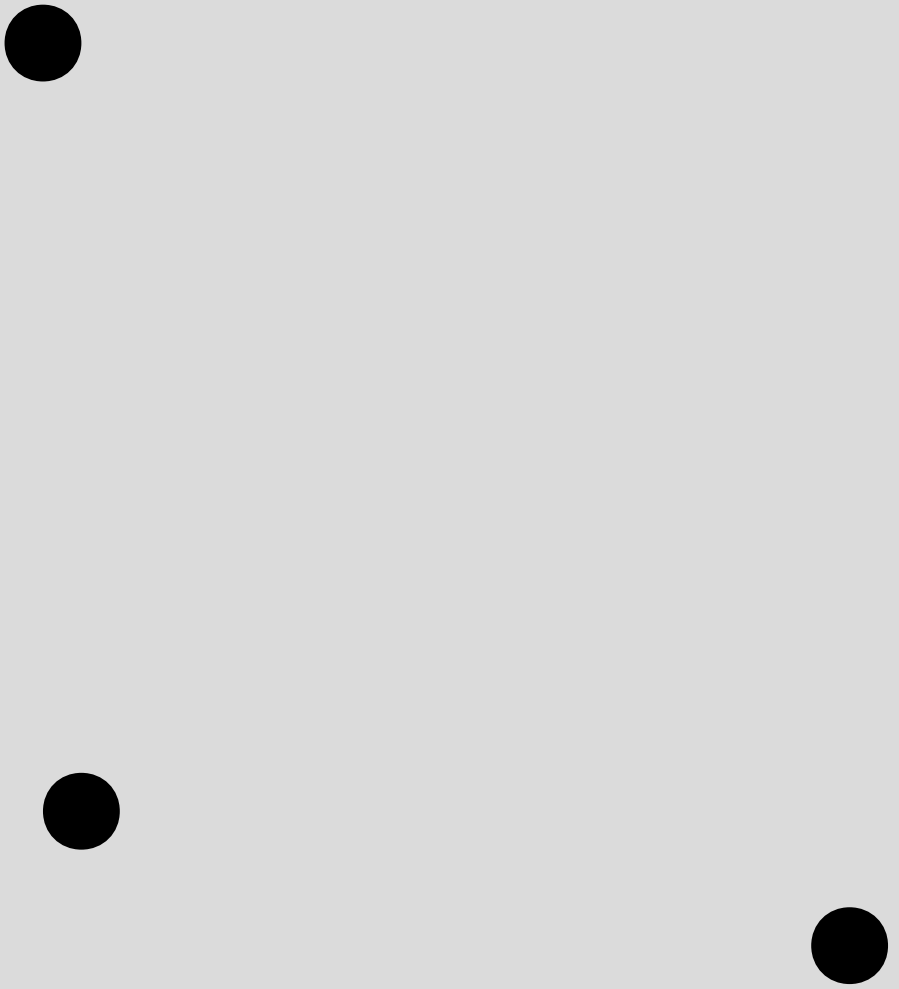
Which Curve?



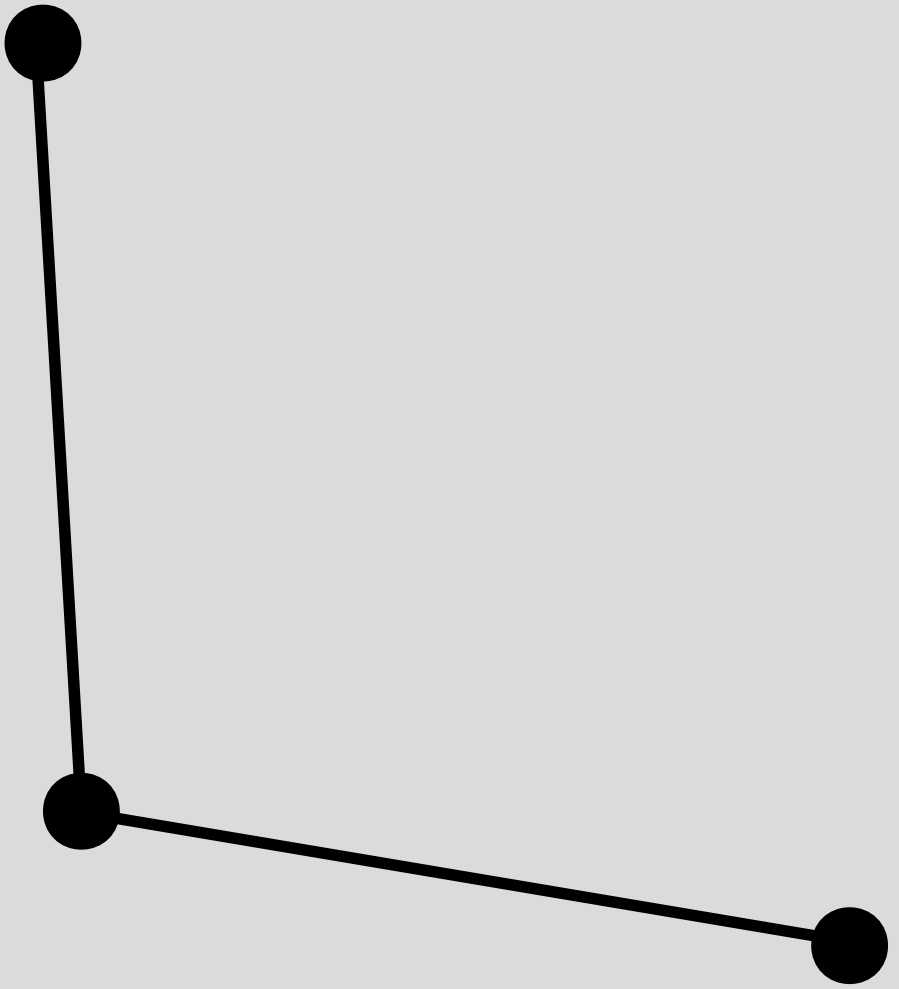
Which Curve?



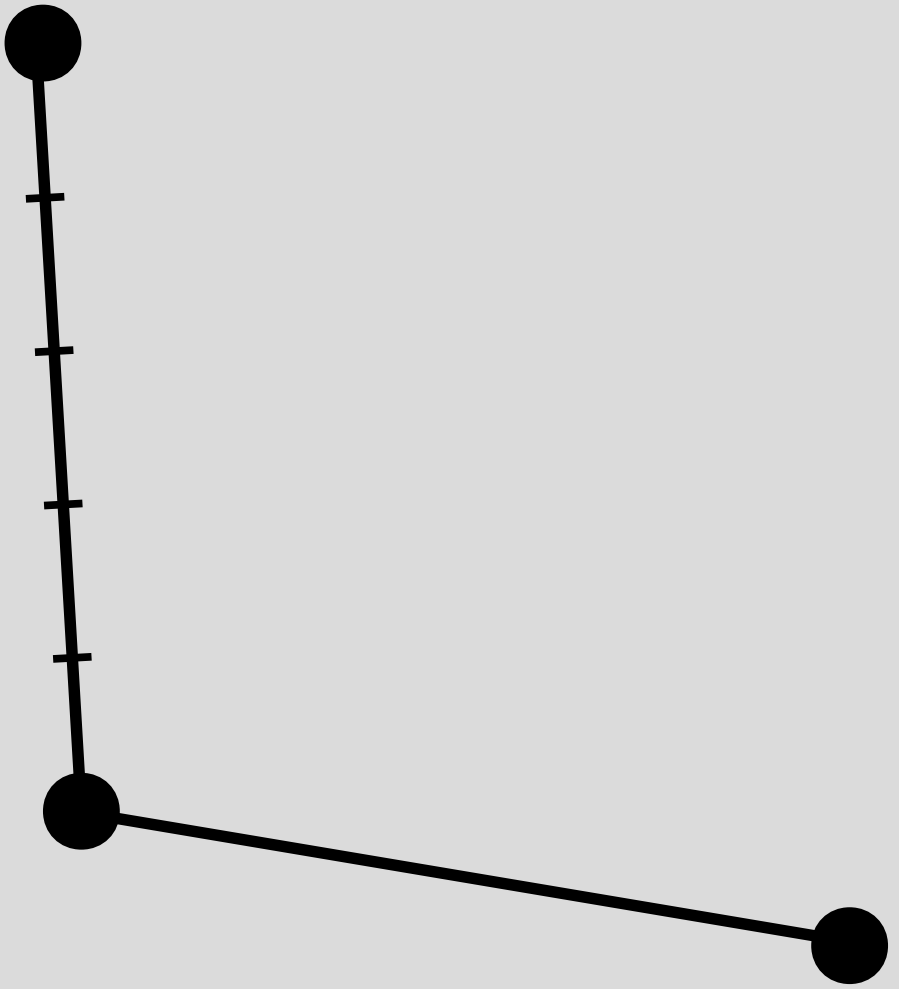
Curves



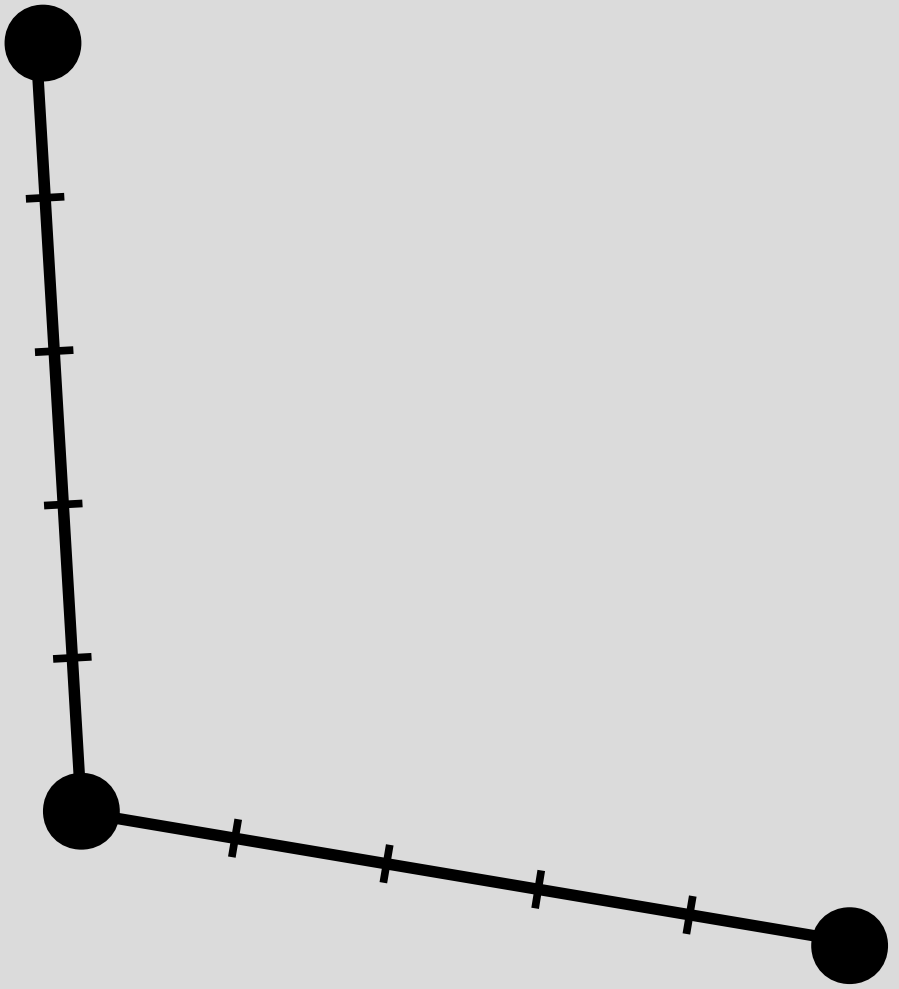
Curves



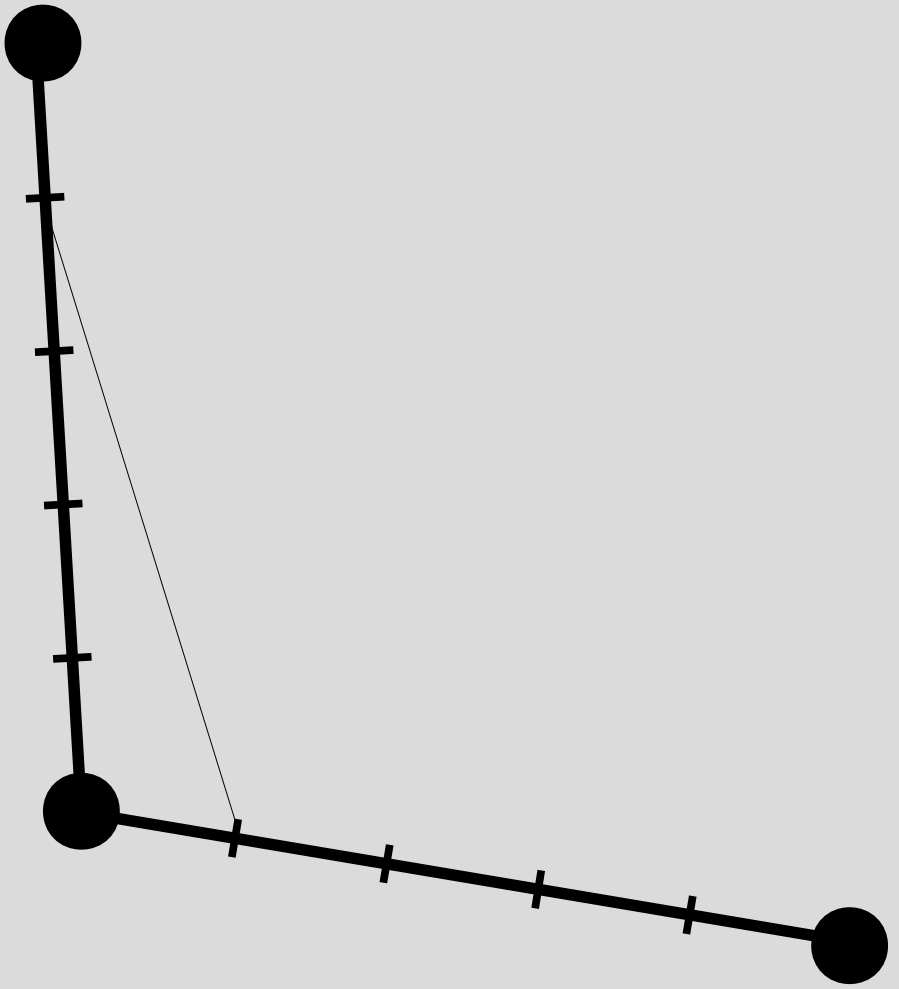
Curves



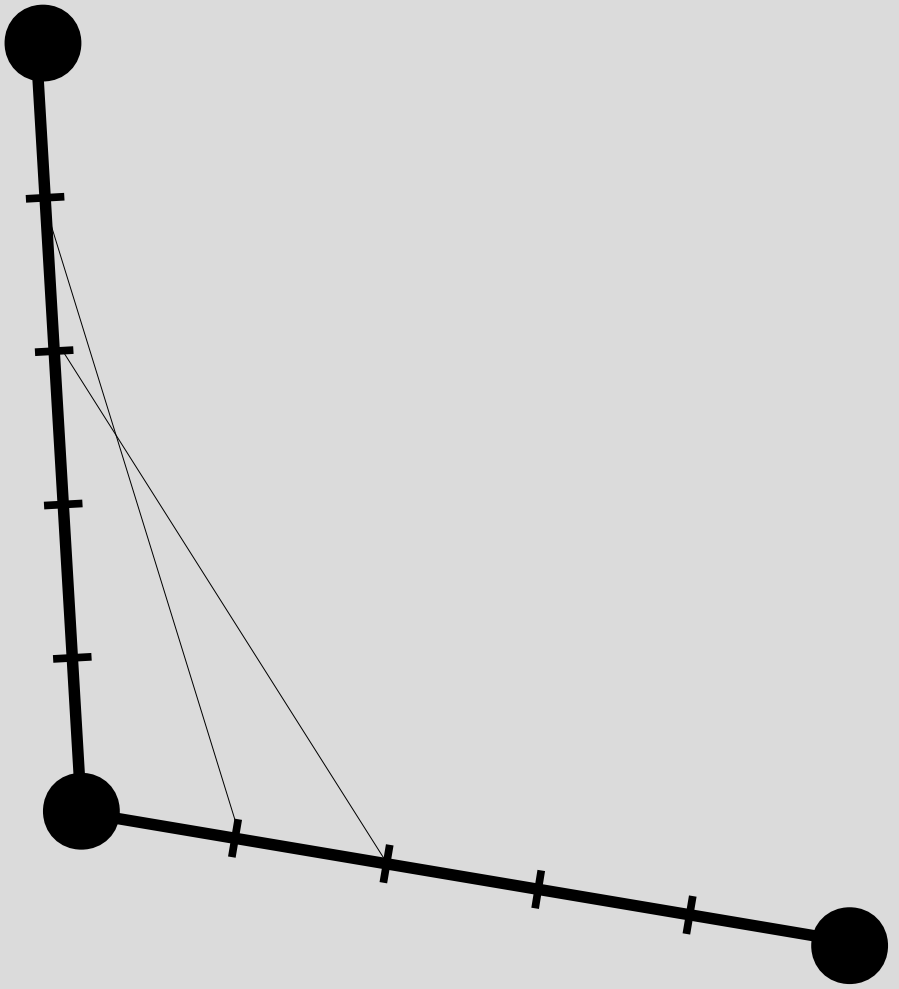
Curves



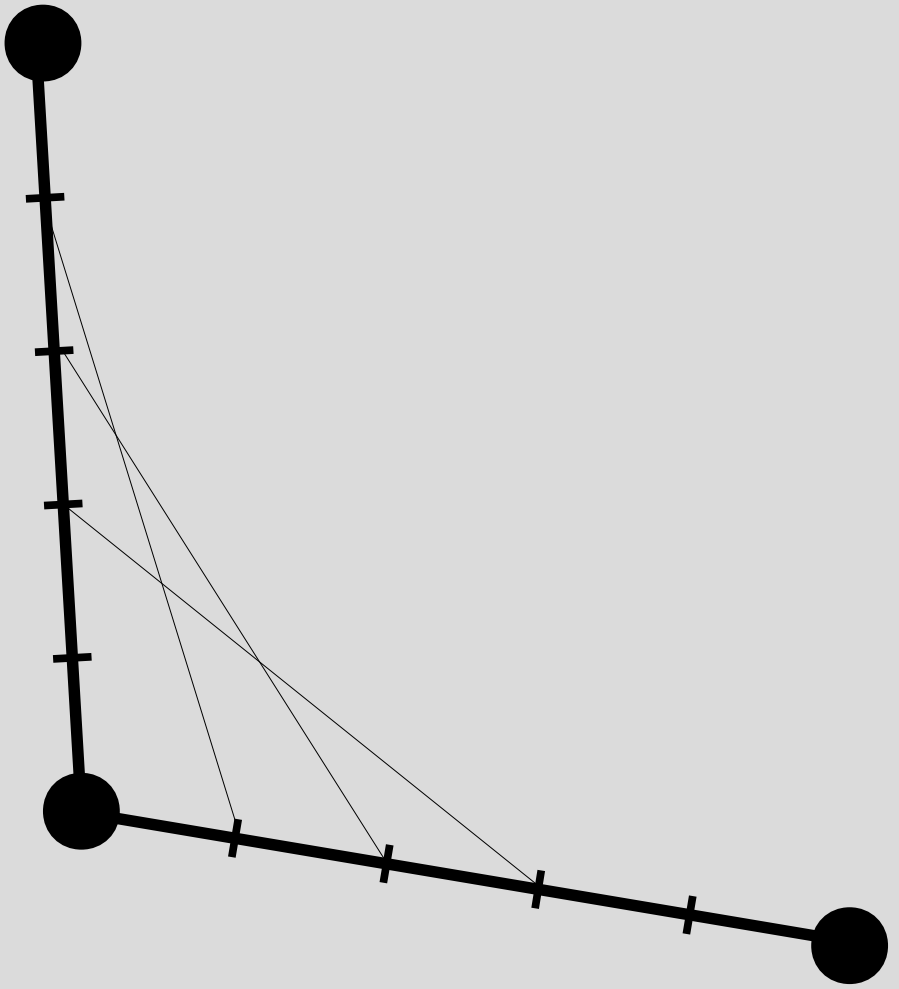
Curves



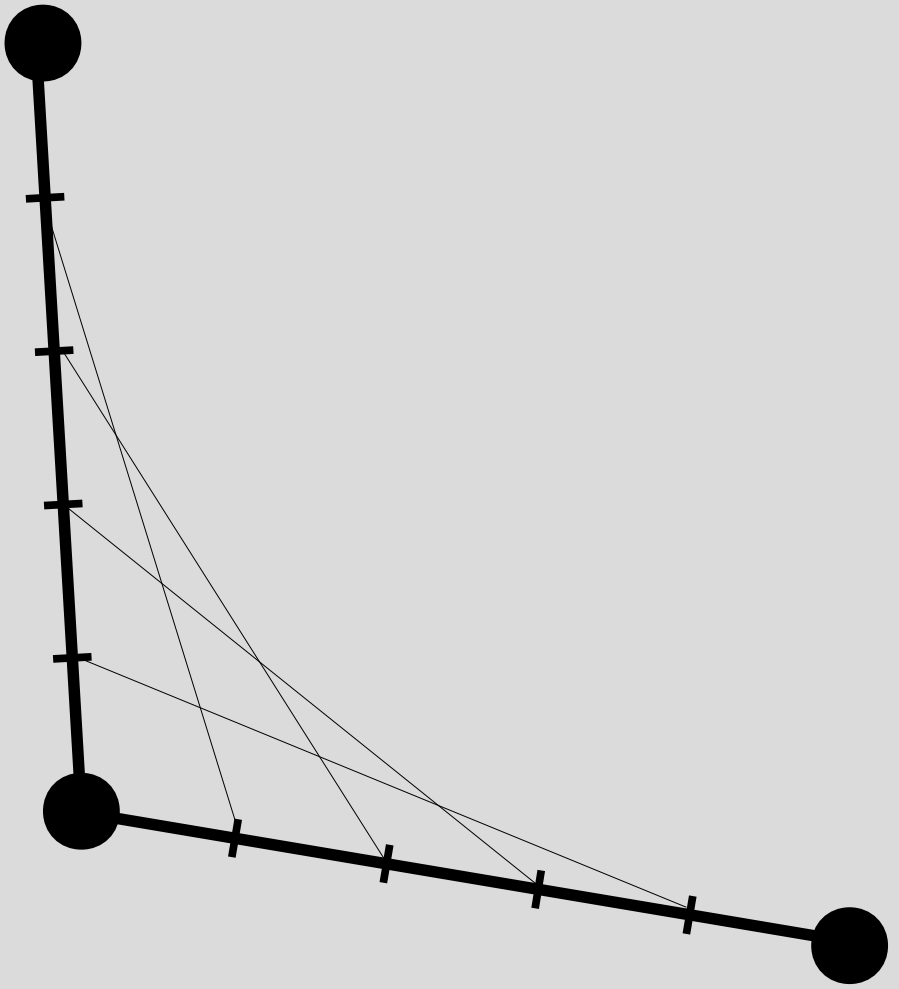
Curves



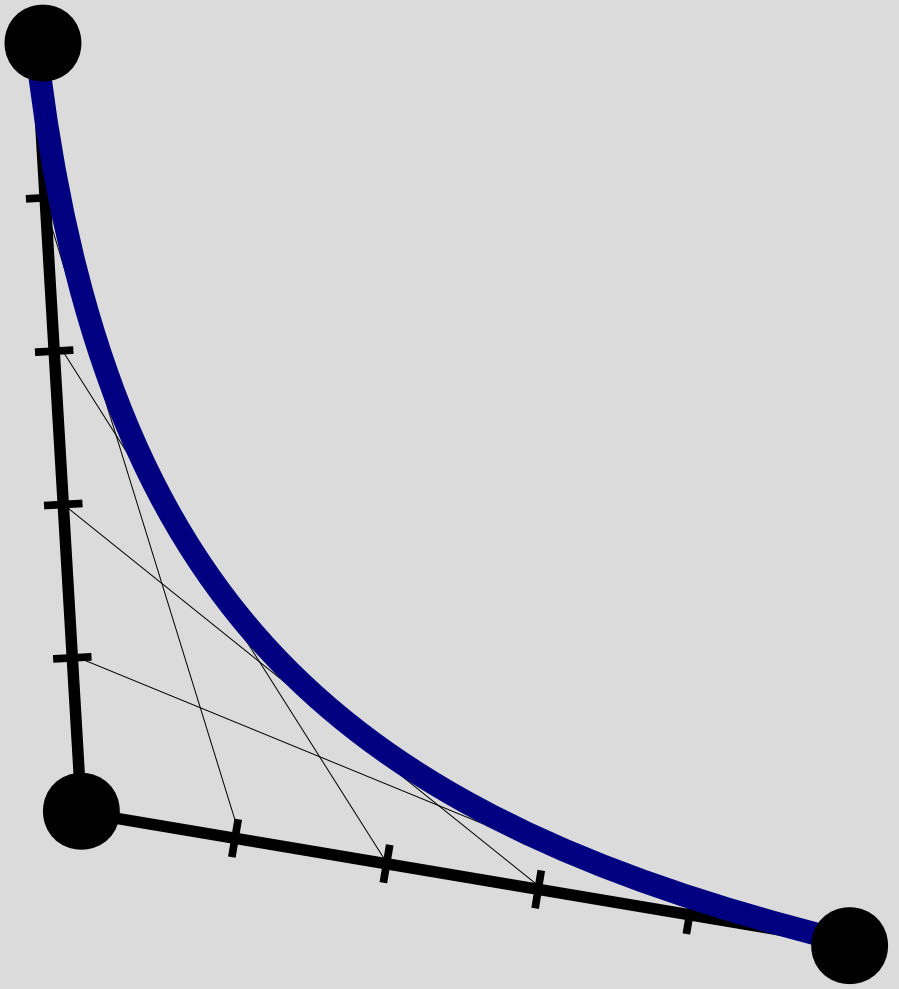
Curves



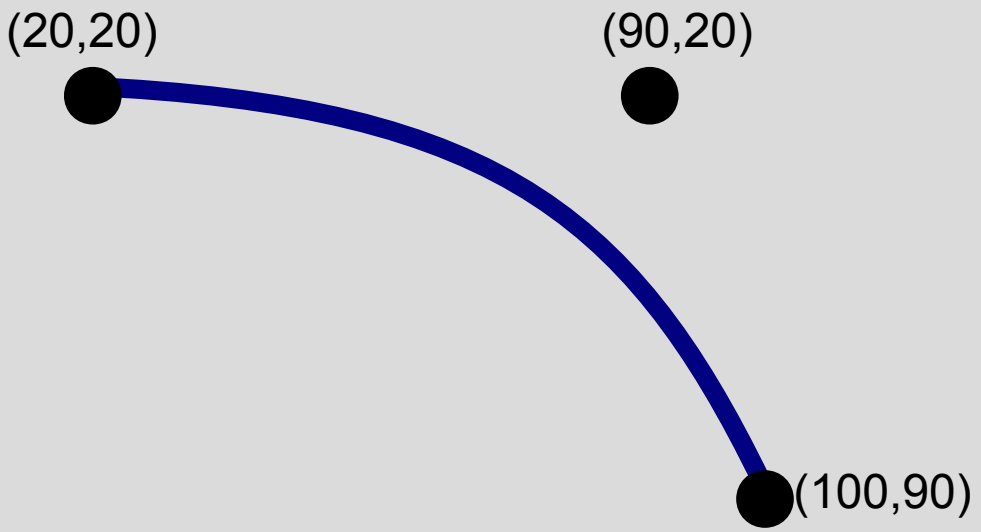
Curves



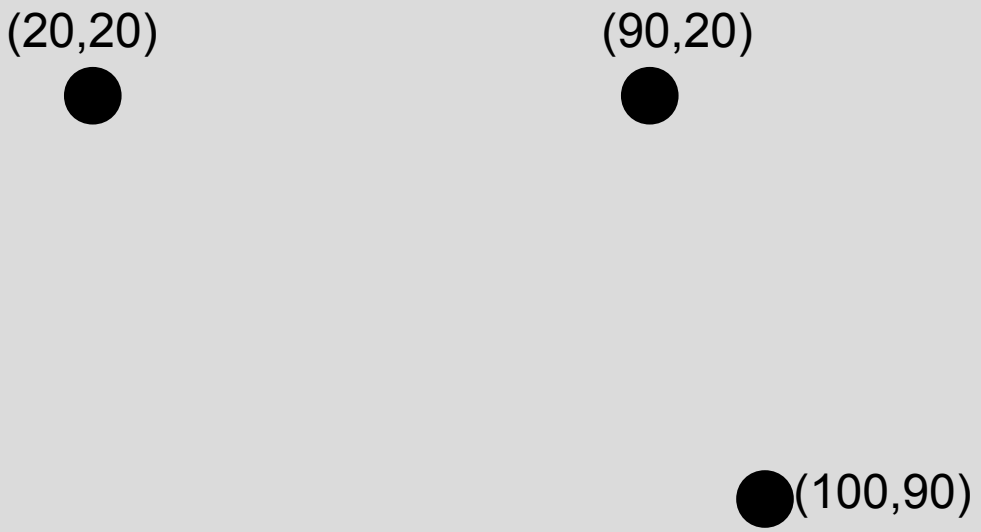
Curves



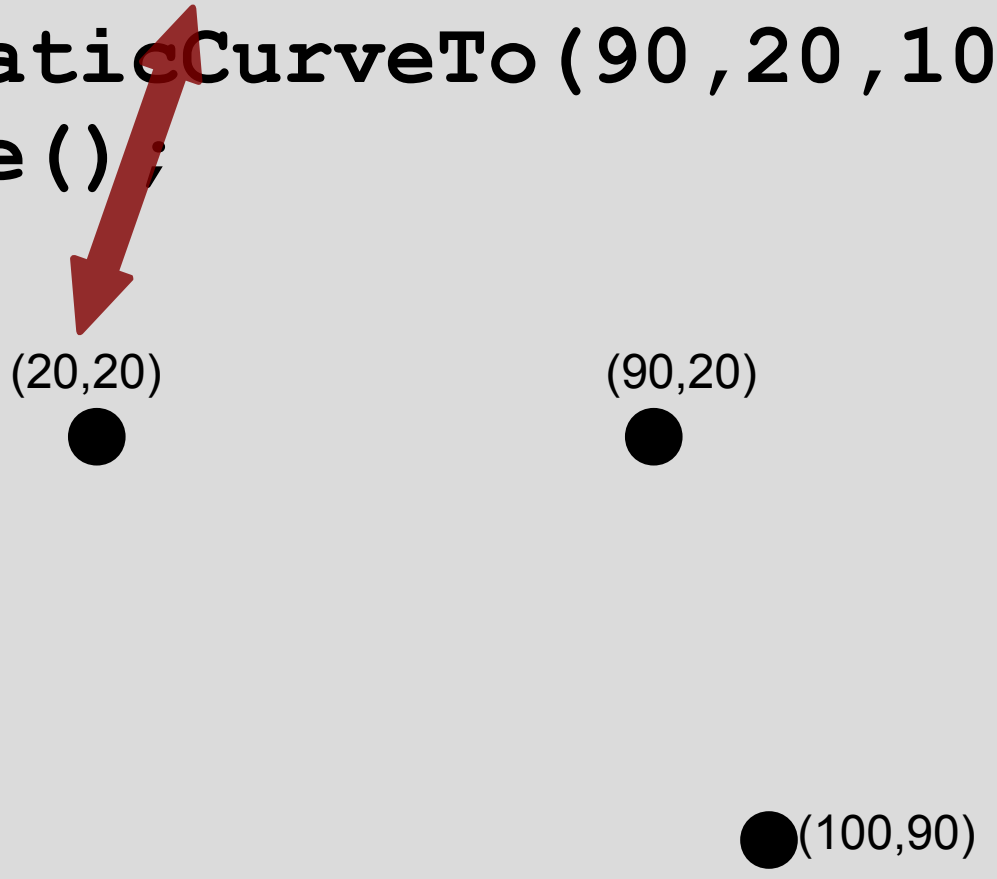
```
c.moveTo(20,20);
c.quadraticCurveTo(90,20,100,90);
c.stroke();
```



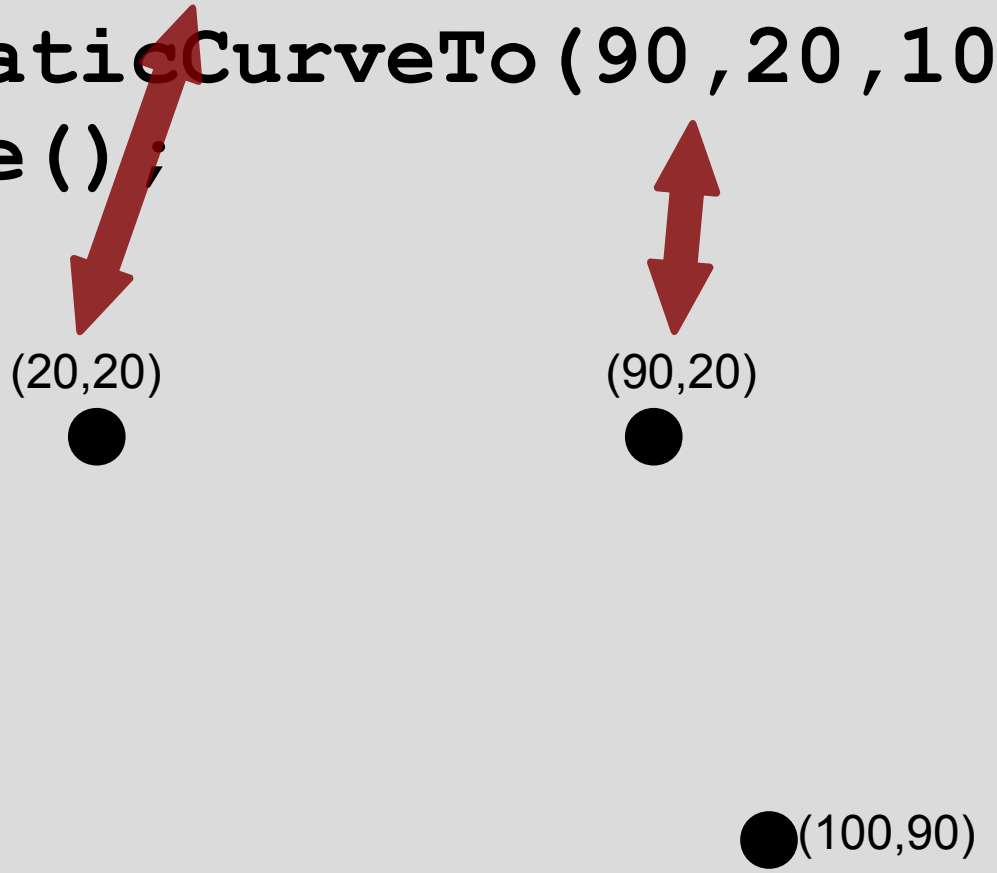
```
c.moveTo(20,20);
c.quadraticCurveTo(90,20,100,90);
c.stroke();
```



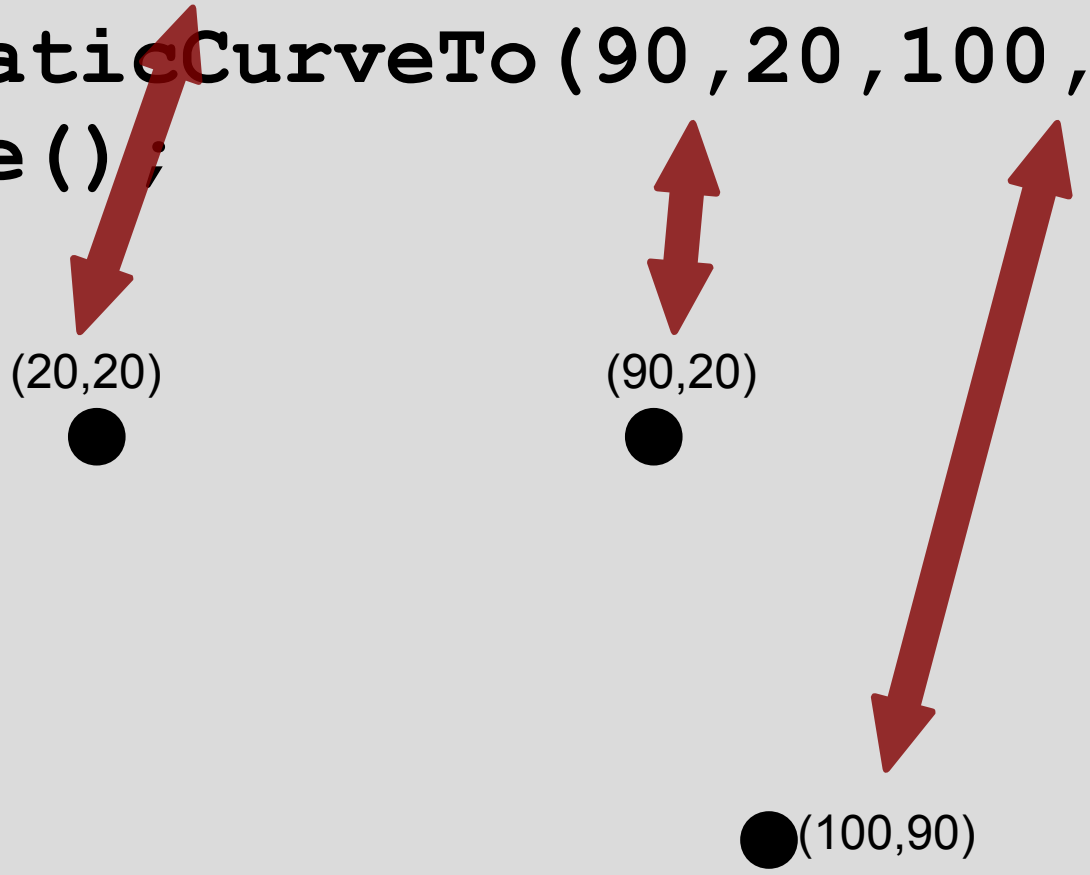
```
c.moveTo(20,20);
c.quadraticCurveTo(90,20,100,90);
c.stroke();
```



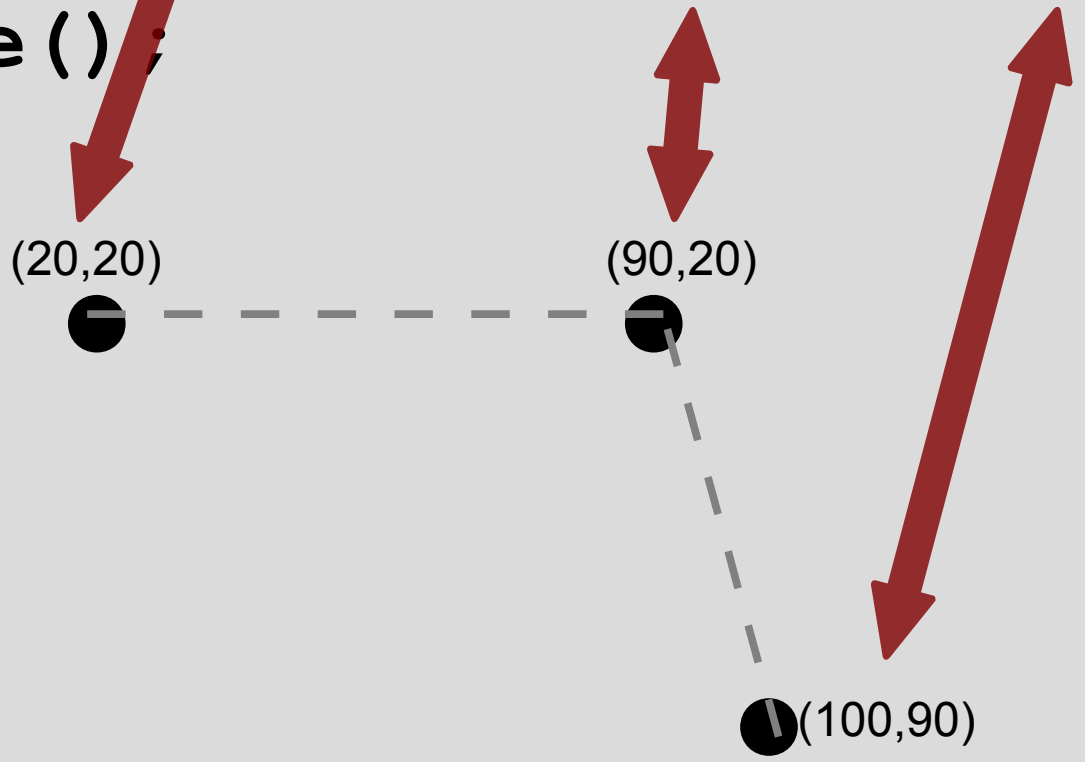
```
c.moveTo(20,20);
c.quadraticCurveTo(90,20,100,90);
c.stroke();
```



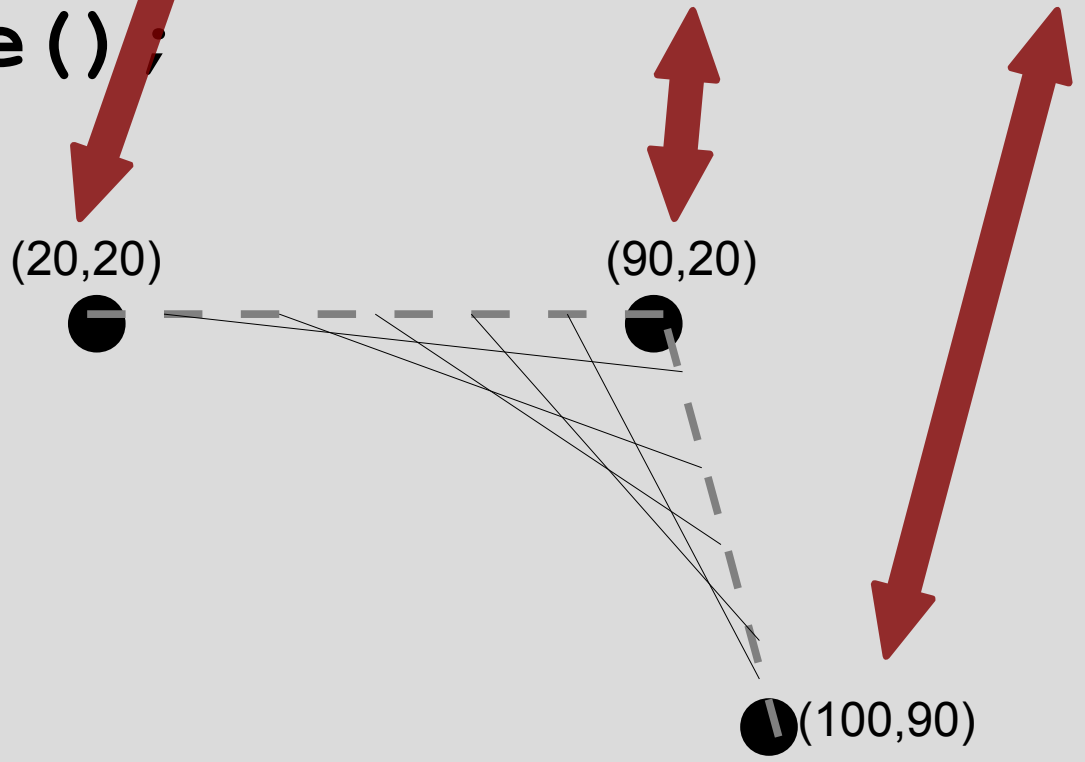
```
c.moveTo(20,20);
c.quadraticCurveTo(90,20,100,90);
c.stroke();
```



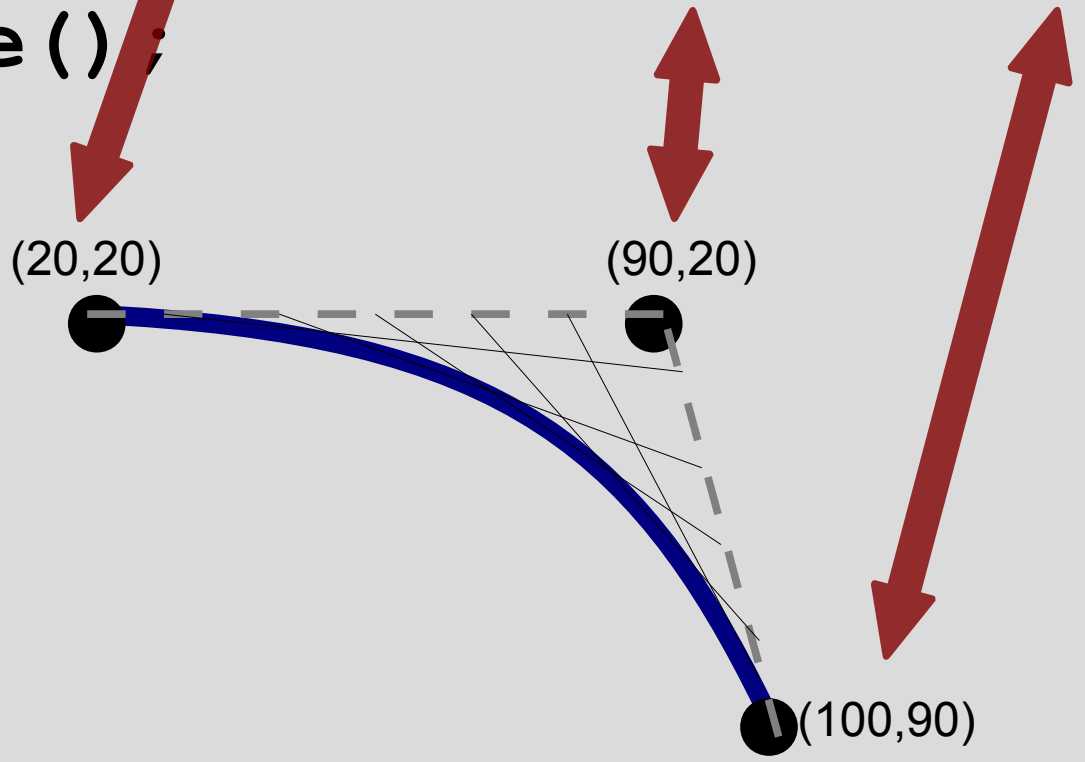
```
c.moveTo(20,20);
c.quadraticCurveTo(90,20,100,90);
c.stroke();
```



```
c.moveTo(20,20);
c.quadraticCurveTo(90,20,100,90);
c.stroke();
```

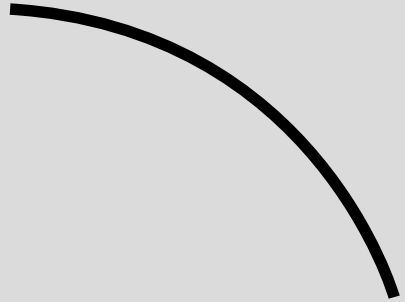


```
c.moveTo(20,20);
c.quadraticCurveTo(90,20,100,90);
c.stroke();
```

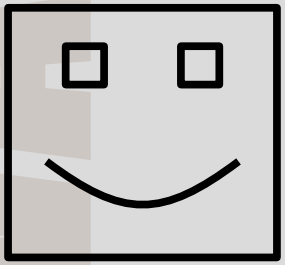


Drawing a Curve

```
c.moveTo(20,20);
c.quadraticCurveTo(90,20,100,90);
c.stroke();
```



Ideas

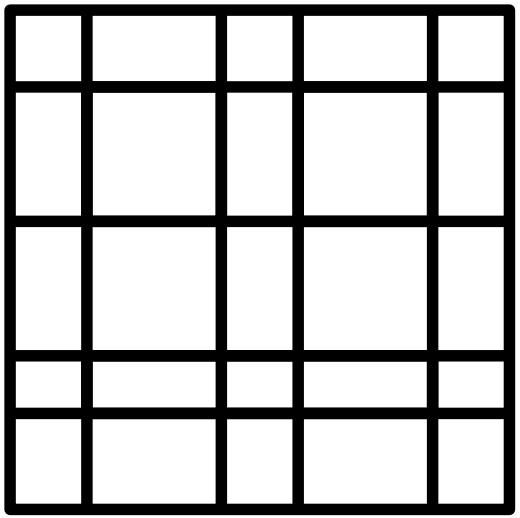


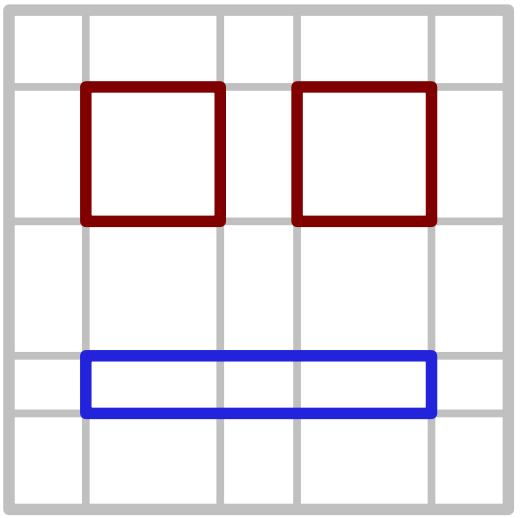
F12

ctrl - shift⇧ J

cmd⌘ - option⌥alt - C

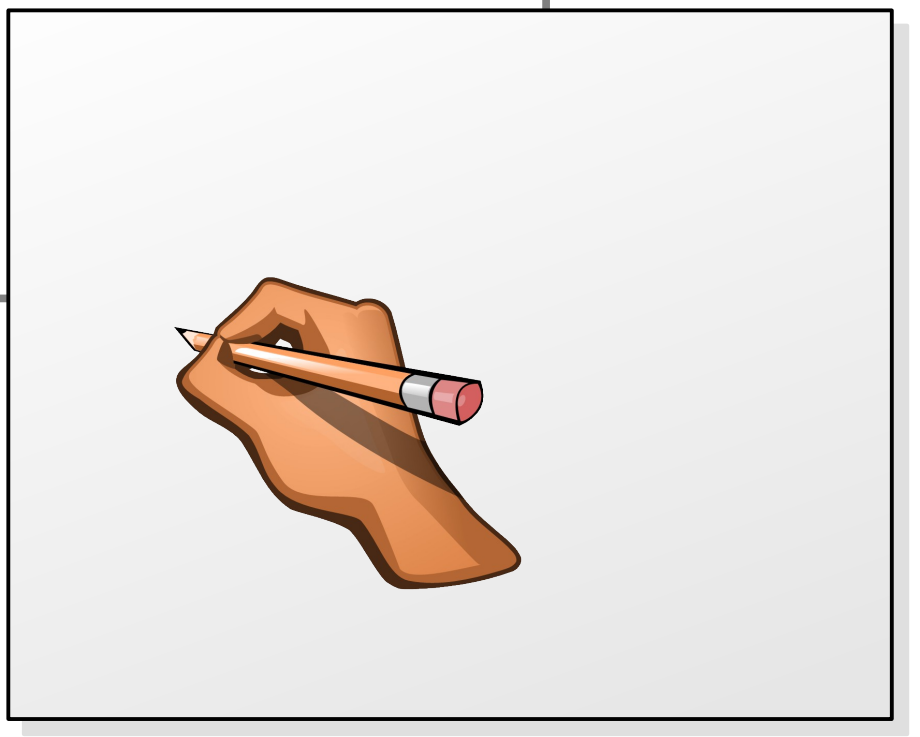
Colored Lines





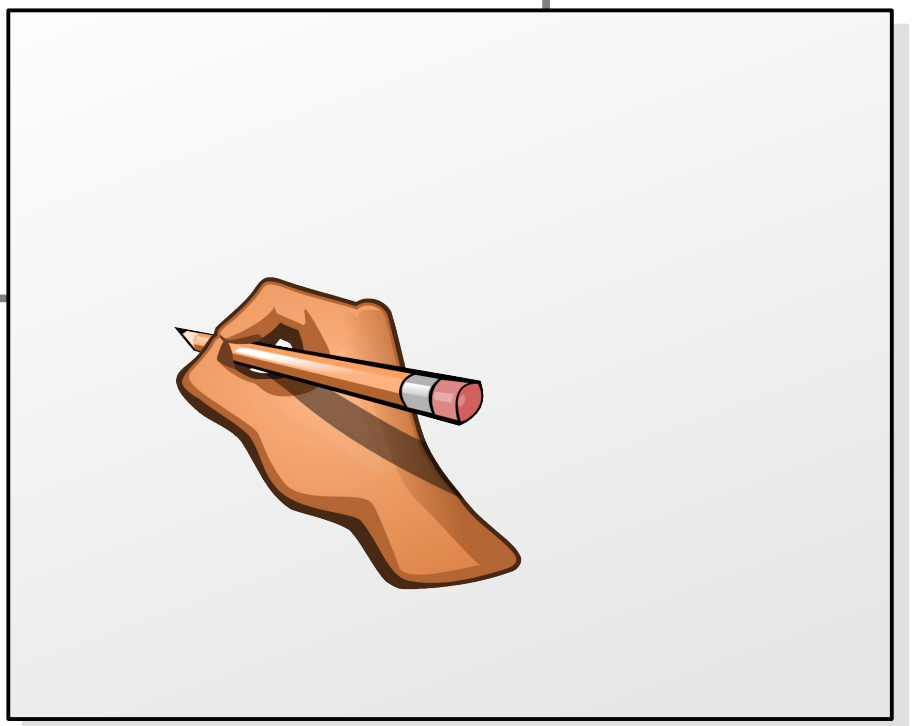
Review

```
c.moveTo(20,90);
c.lineTo(90,90);
c.stroke();
```



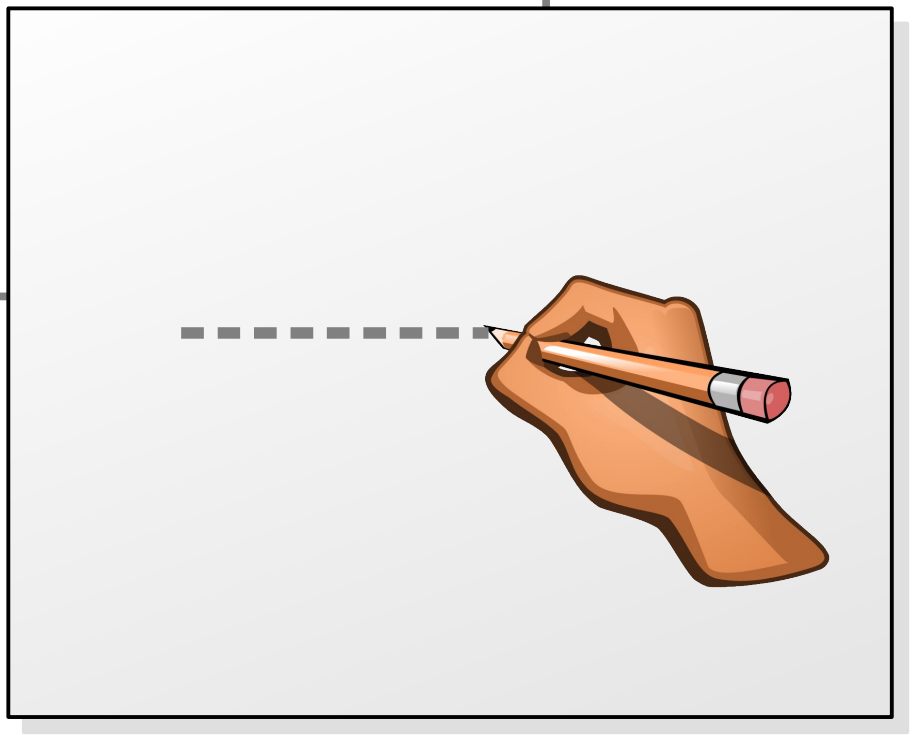
Review

```
c.moveTo(20,90);
c.lineTo(90,90);
c.stroke();
```



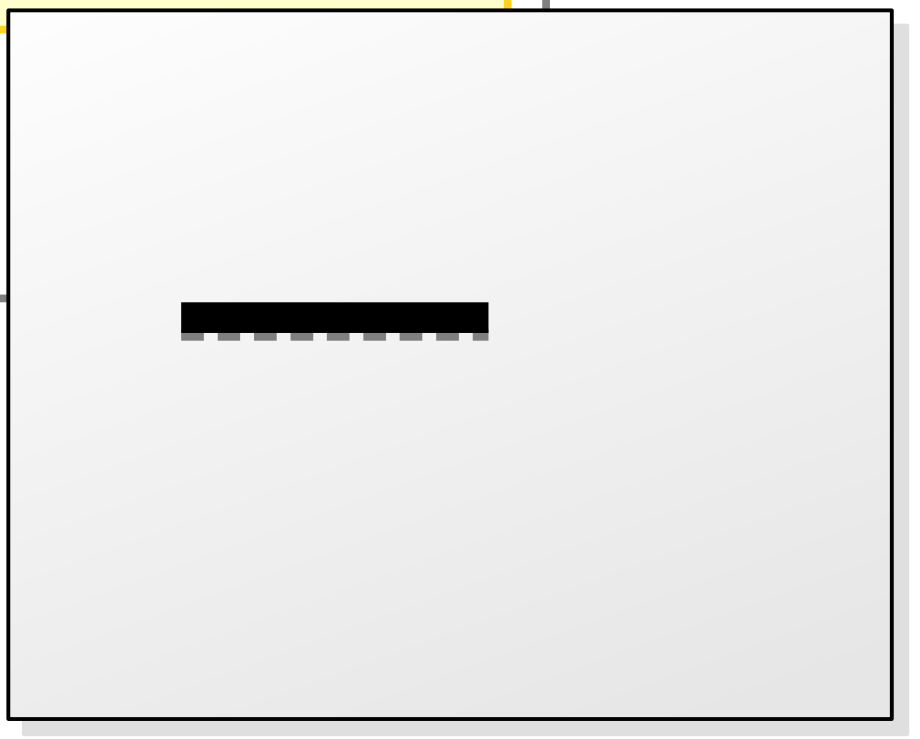
Review

```
c.moveTo(20,90);
c.lineTo(90,90);
c.stroke();
```



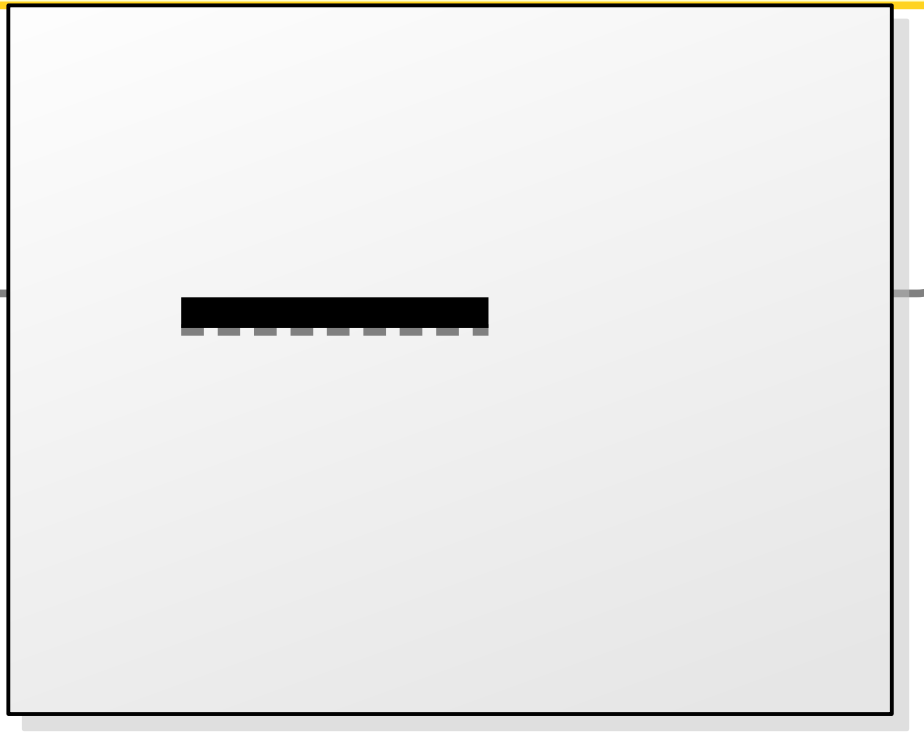
Review

```
c.moveTo(20,90);
c.lineTo(90,90);
c.stroke();
```



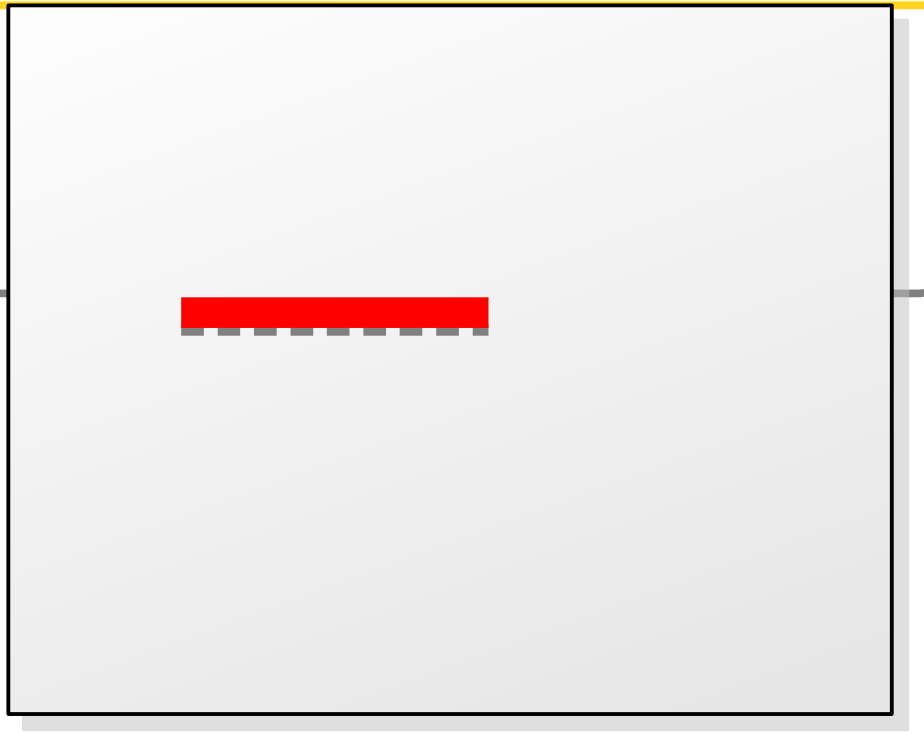
Colored Lines

```
c.moveTo(20,90);
c.lineTo(90,90);
c.strokeStyle = 'red';
c.stroke();
```



Colored Lines

```
c.moveTo(20,90);
c.lineTo(90,90);
c.strokeStyle = 'red';
c.stroke();
```



Colors

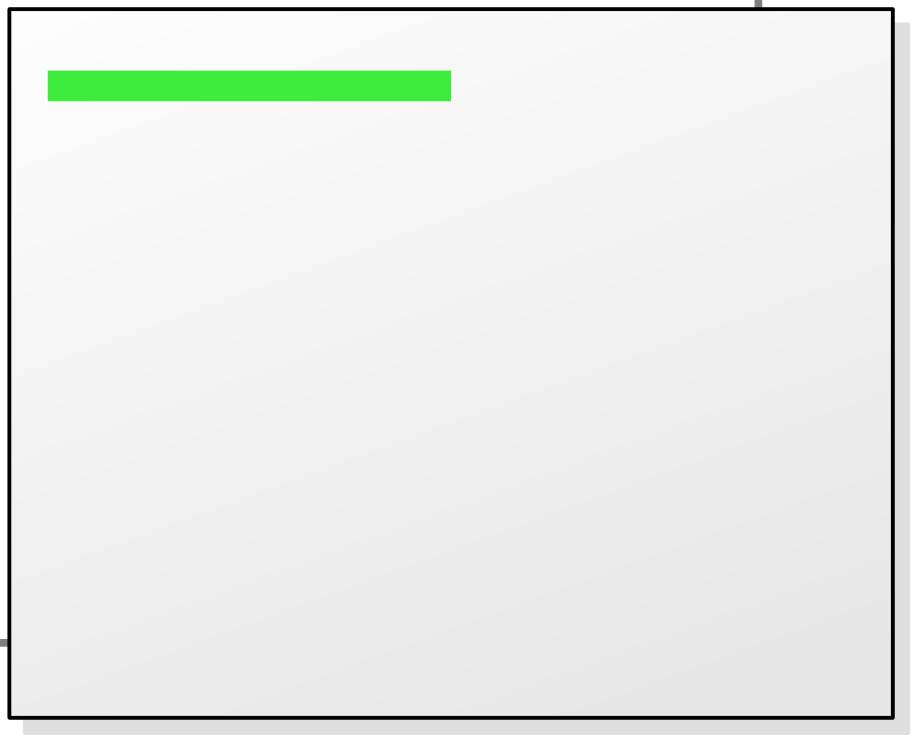
```
c.moveTo(20,90);
c.lineTo(90,90);
c.strokeStyle = 'red';
c.stroke();
```

black	green	red	pink
blue	orange	white	gray
brown	purple	yellow	

Drawing Two Lines

Drawing Two Lines

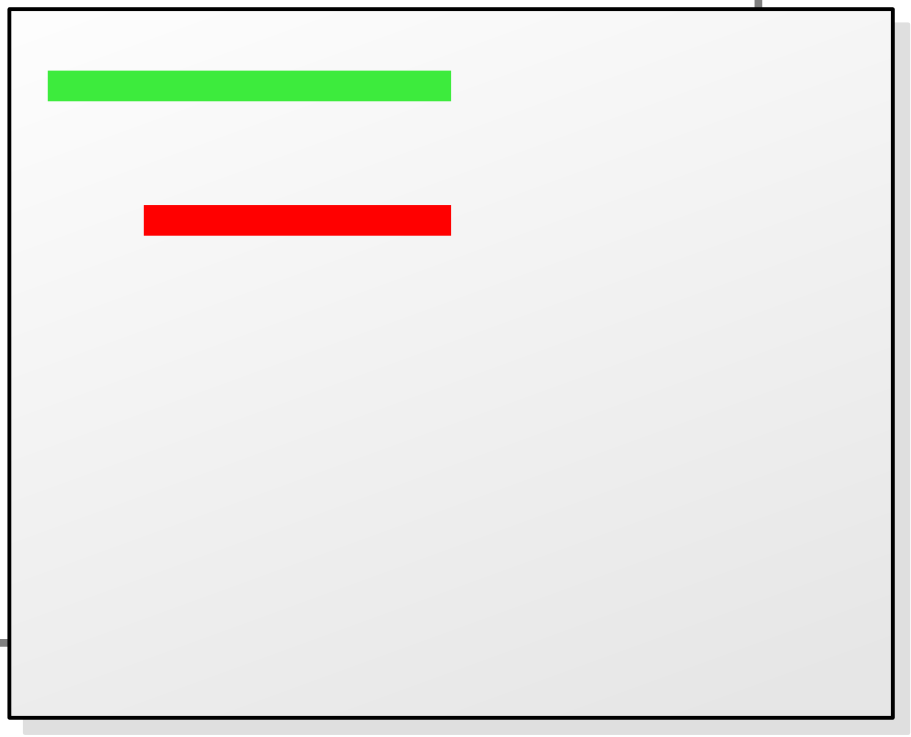
```
c.moveTo(5,5);
c.lineTo(90,5);
c.strokeStyle='green';
c.stroke();
```



Drawing Two Lines

```
c.moveTo(5,5);
c.lineTo(90,5);
c.strokeStyle='green';
c.stroke();


c.moveTo(20,20);
c.lineTo(90,20);
c.strokeStyle='red';
c.stroke();
```



Drawing Two Lines

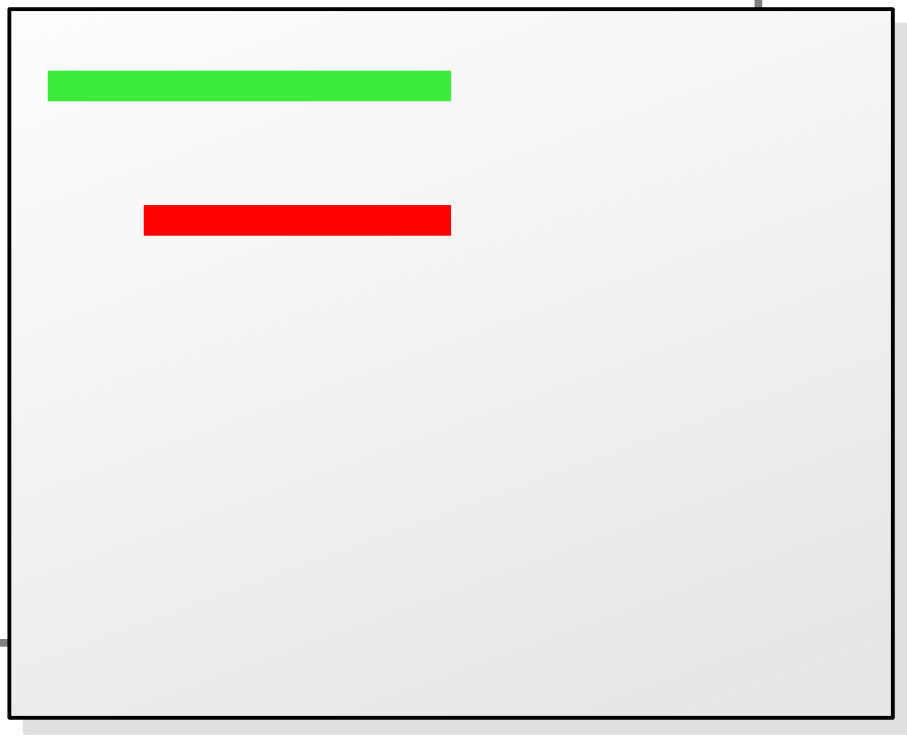
```
c.moveTo(5,5);
c.lineTo(90,5);
c.strokeStyle='green';
c.stroke();


c.moveTo(20,20);
c.lineTo(90,20);
c.strokeStyle='red';
c.stroke();
```

Different Lines, Different Colors

```
c.moveTo(5,5);
c.lineTo(90,5);
c.strokeStyle='green';
c.stroke();

c.beginPath();
c.moveTo(20,20);
c.lineTo(90,20);
c.strokeStyle='red';
c.stroke();
```

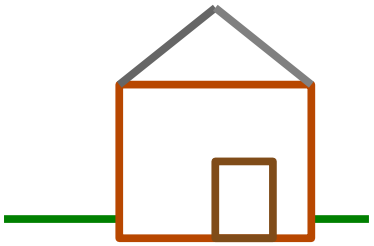


Colored Lines

```
c.beginPath();
c.moveTo(20,20);
c.lineTo(90,20);
c.lineTo(90,90);
c.strokeStyle='red';
c.stroke();
```

black
blue
brown
green
orange
purple
red
white
yellow
pink
gray

Ideas

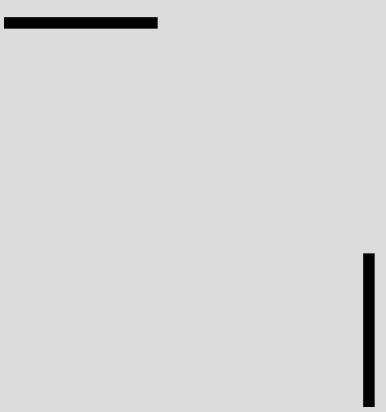


F12

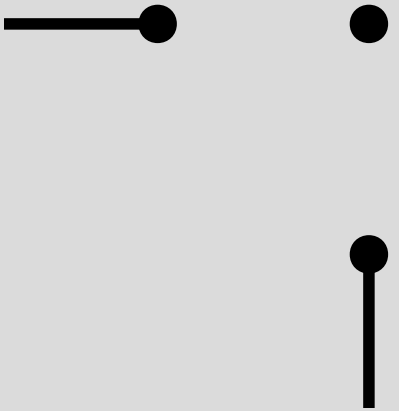
ctrl - shift⇧ J

cmd⌘ - option⌥alt - C

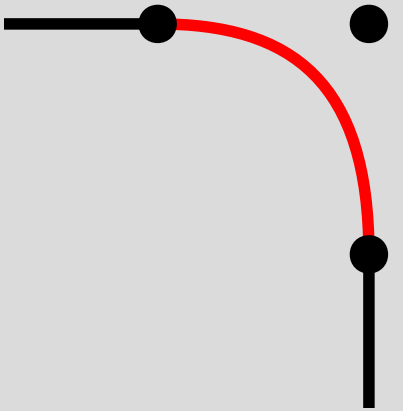
Crazy Curves



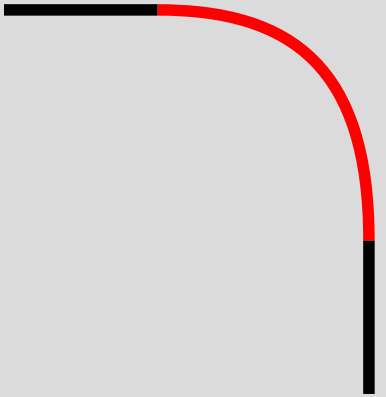
Crazy Curves



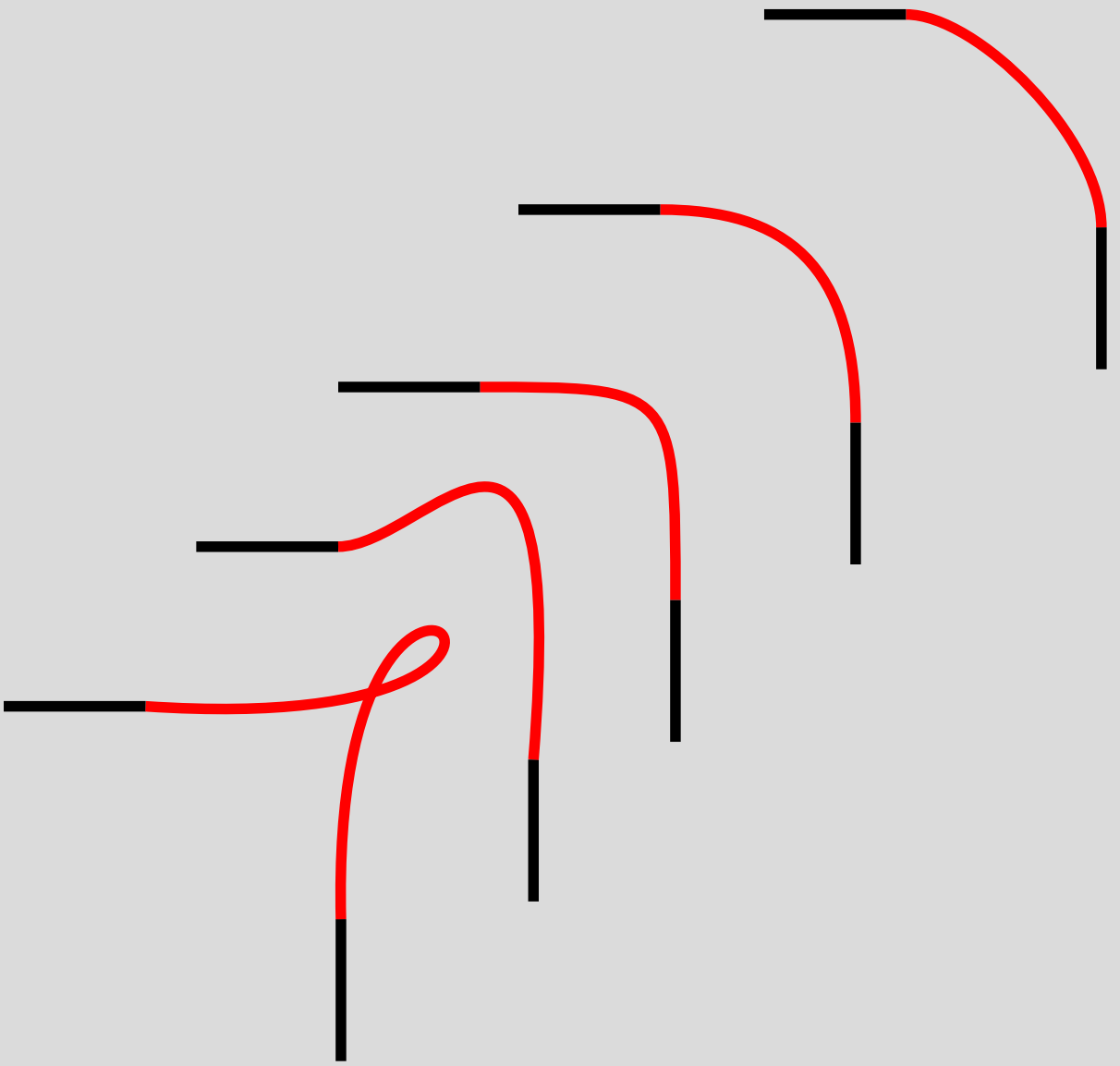
Crazy Curves



Crazy Curves

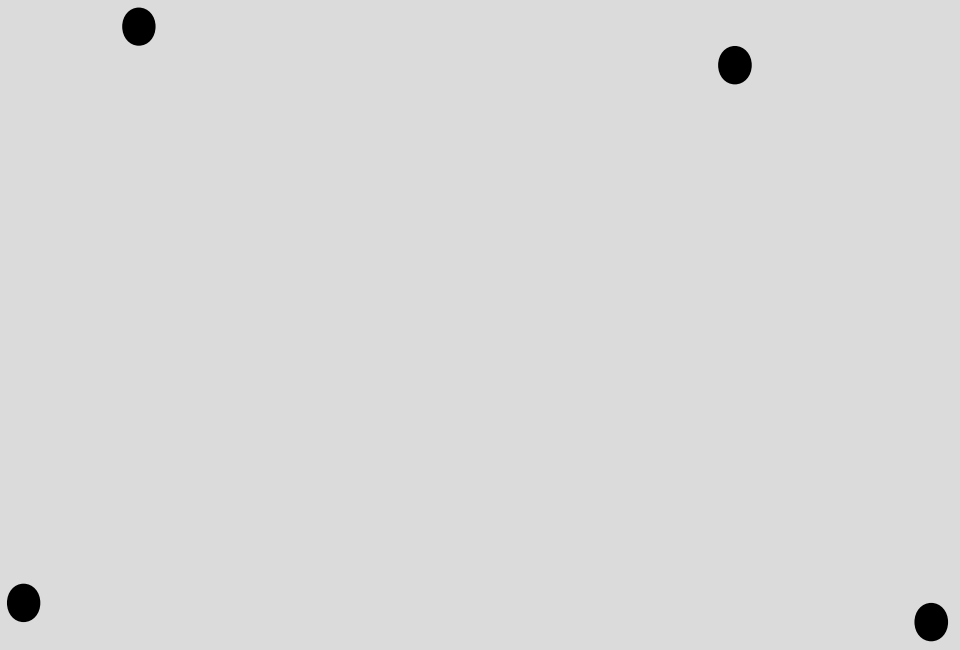


Crazy Curves



4 Point Bezier Curve

- Invented by French mathematicians/engineers around 1960
- Adobe used them in computer graphics in the 1980s



4 Point Bezier Curve

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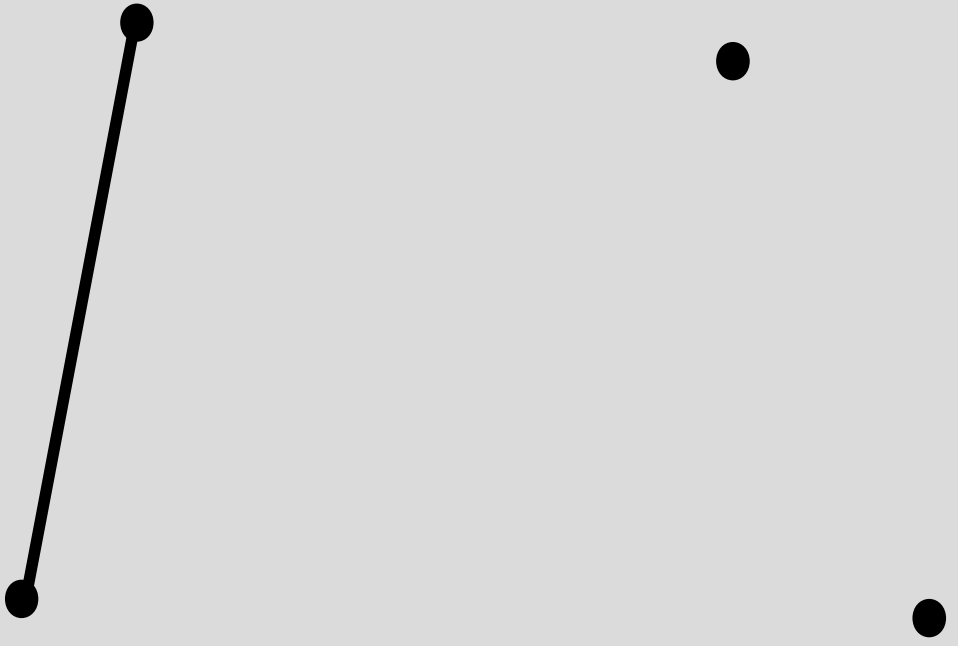

4 Point Bezier Curve

- Invented by French mathematicians/engineers around 1960
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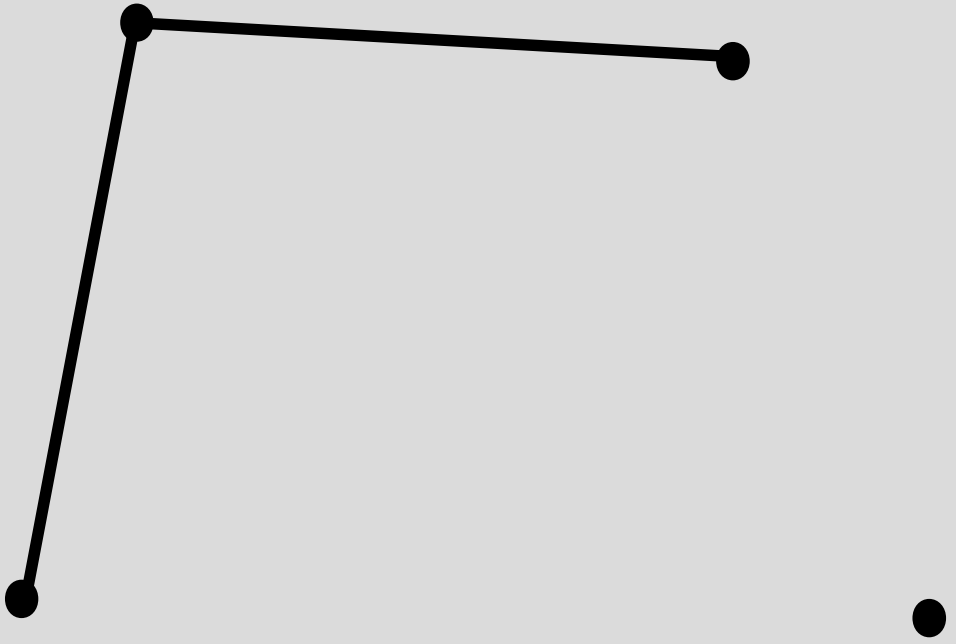

4 Point Bezier Curve

- Invented by French mathematicians/engineers around 1960
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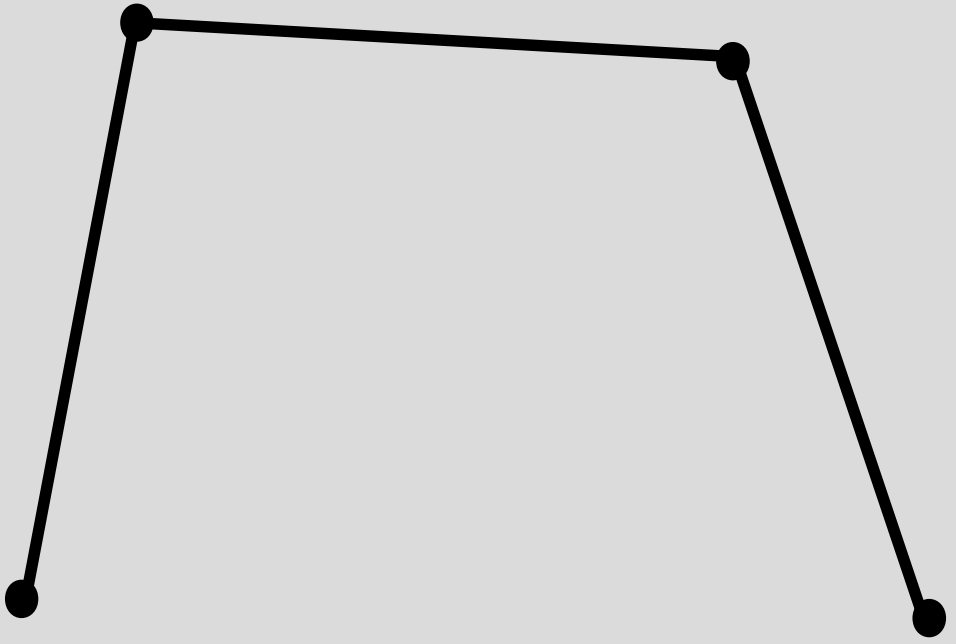

4 Point Bezier Curve

- Invented by French mathematicians/engineers around 1960
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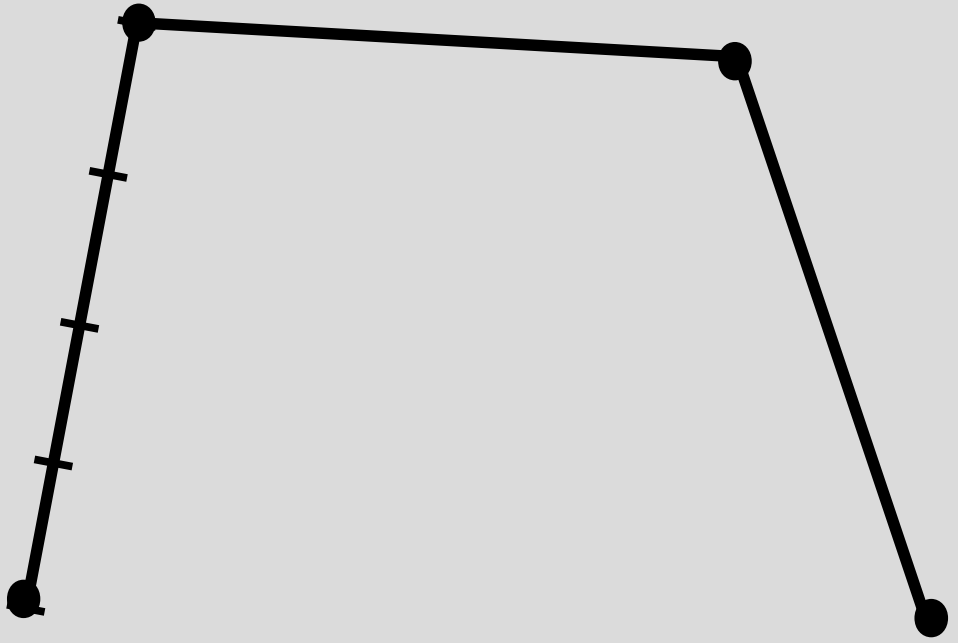

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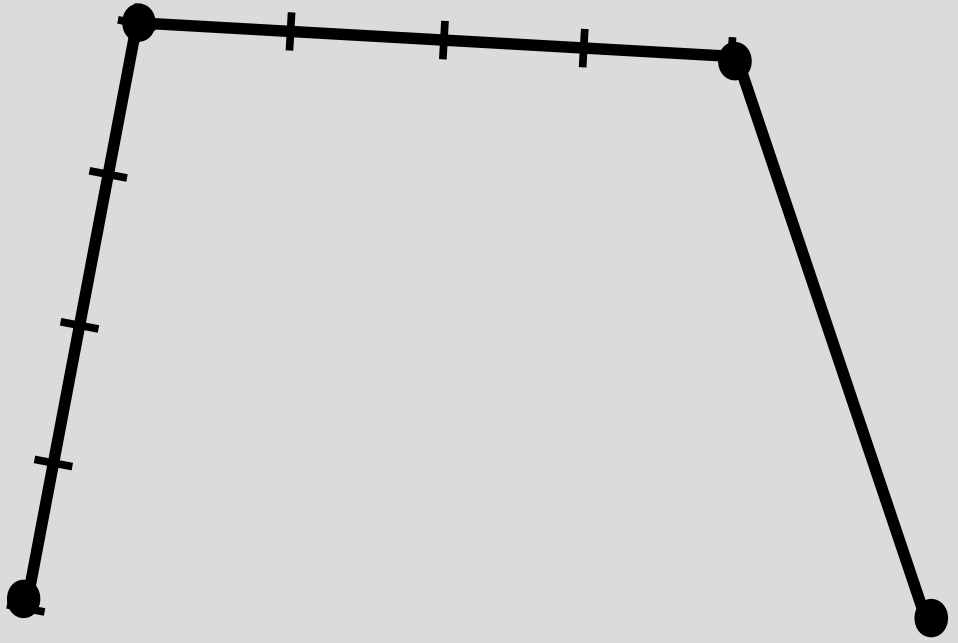
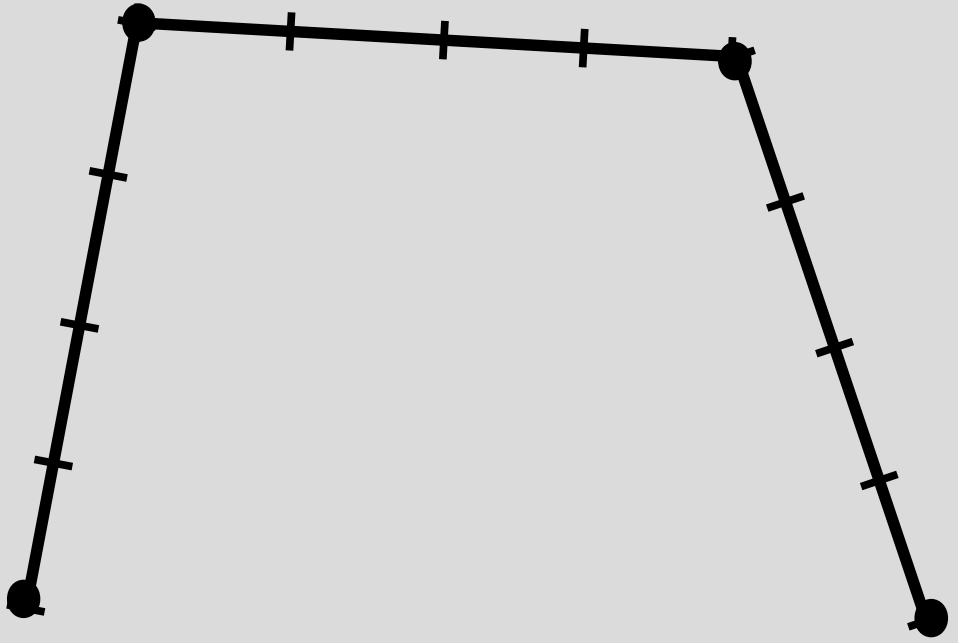
- Invented by French mathematicians/engineers around 1960
- Adobe used them in computer graphics in the 1980s



4 Point Bezier Curve

- Invented by French mathematicians/engineers around 1960
- Adobe used them in computer graphics in the 1980s



4 Point Bezier Curve

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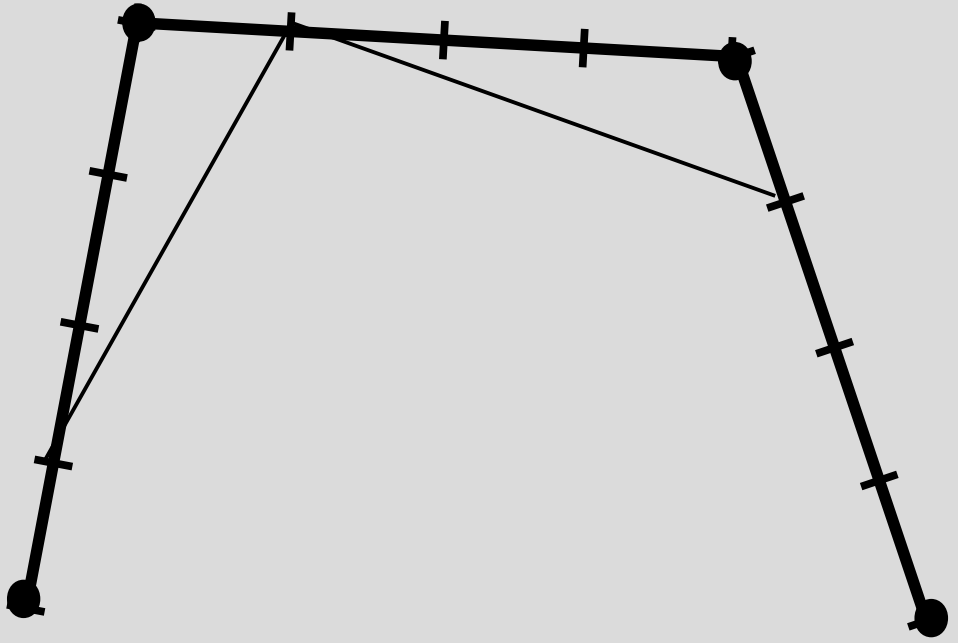

4 Point Bezier Curve

- Invented by French mathematicians/engineers around 1960
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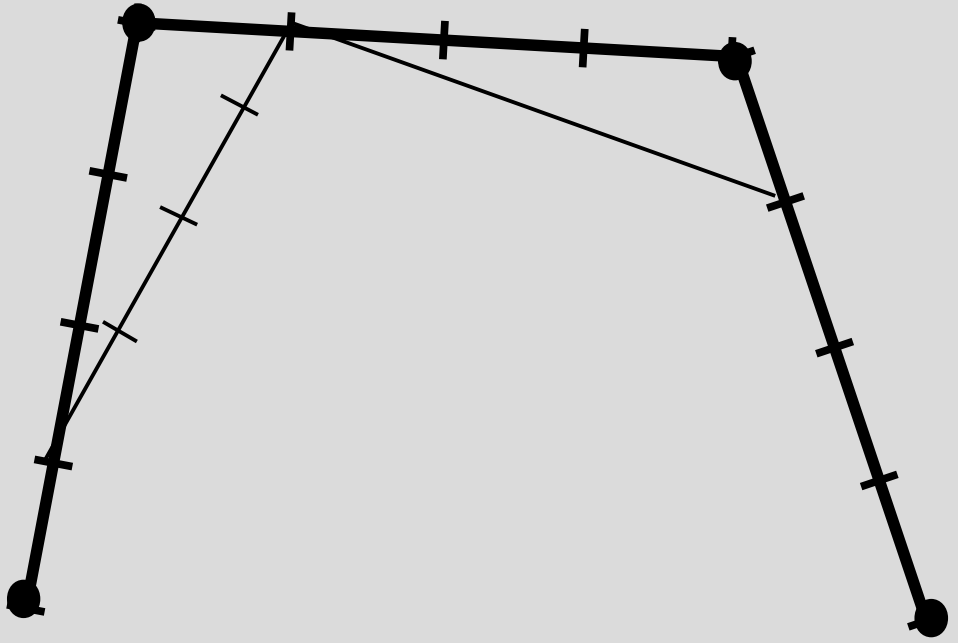
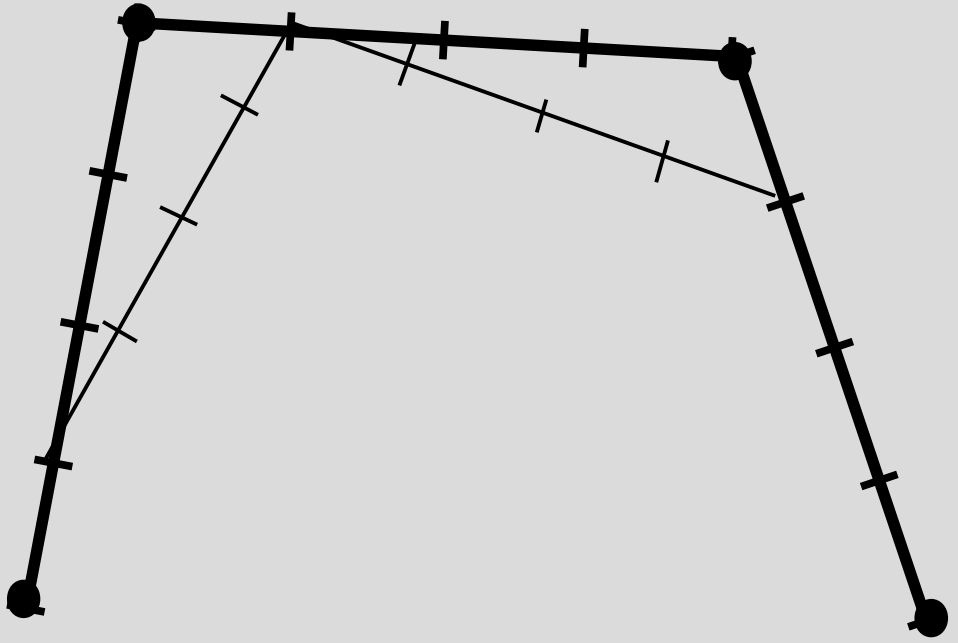


4 Point Bezier Curve

- Invented by French mathematicians/engineers around 1960
- Adobe used them in computer graphics in the 1980s



4 Point Bezier Curve

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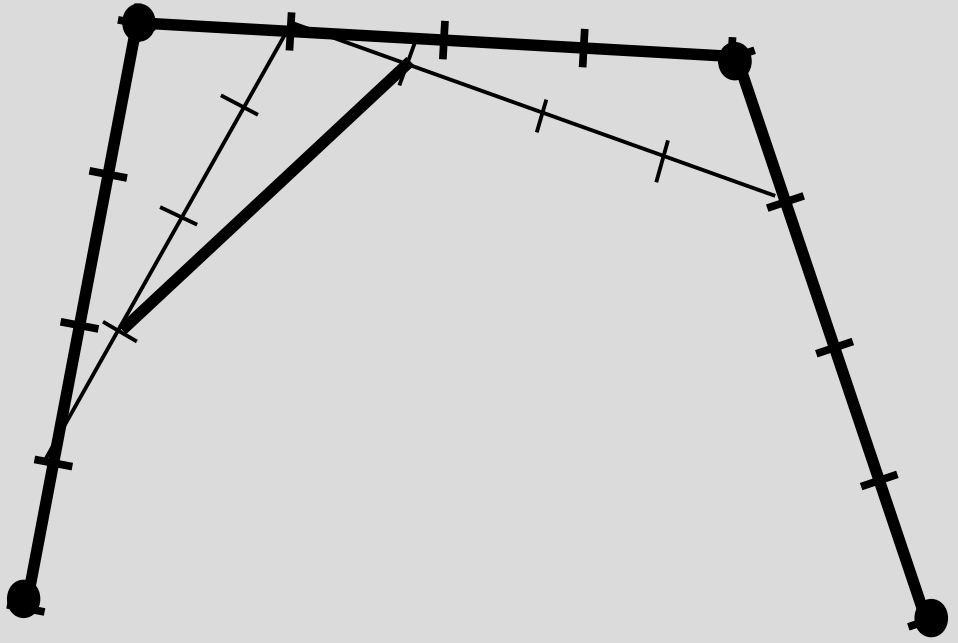

4 Point Bezier Curve

- Invented by French mathematicians/engineers around 1960
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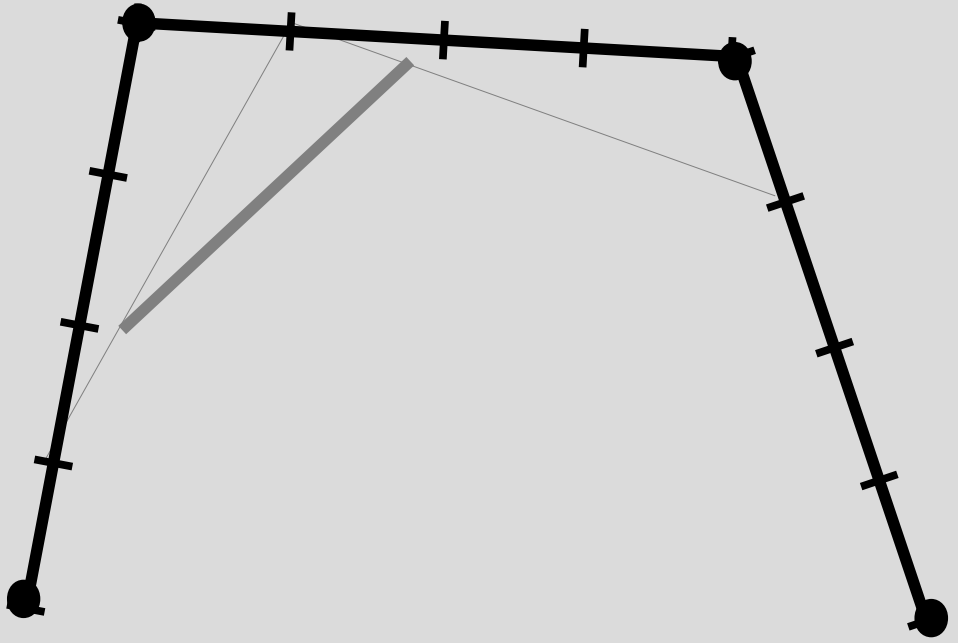

4 Point Bezier Curve

- Invented by French mathematicians/engineers around 1960
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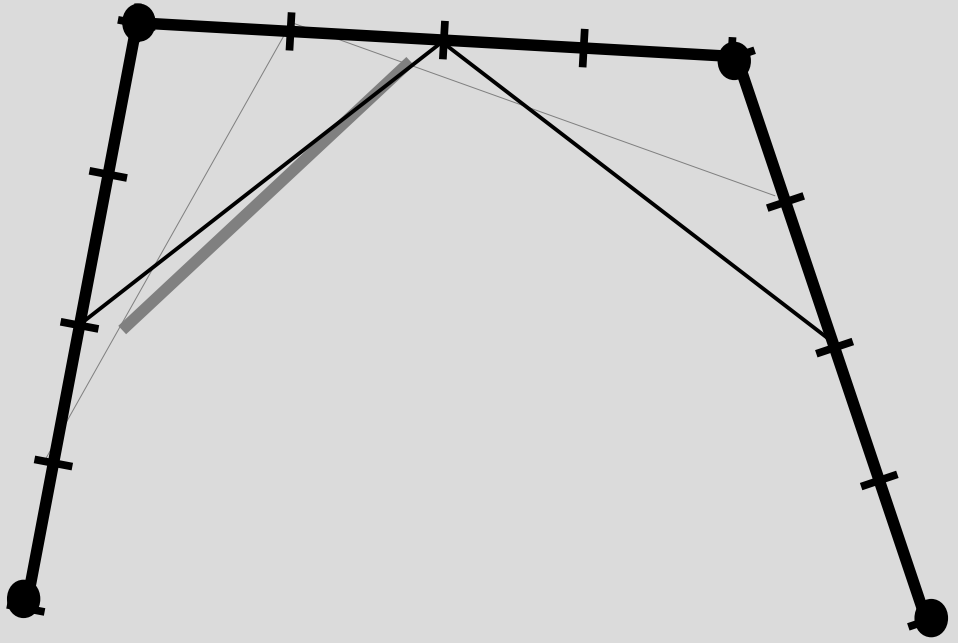

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- Invented by French mathematicians/engineers around 1960
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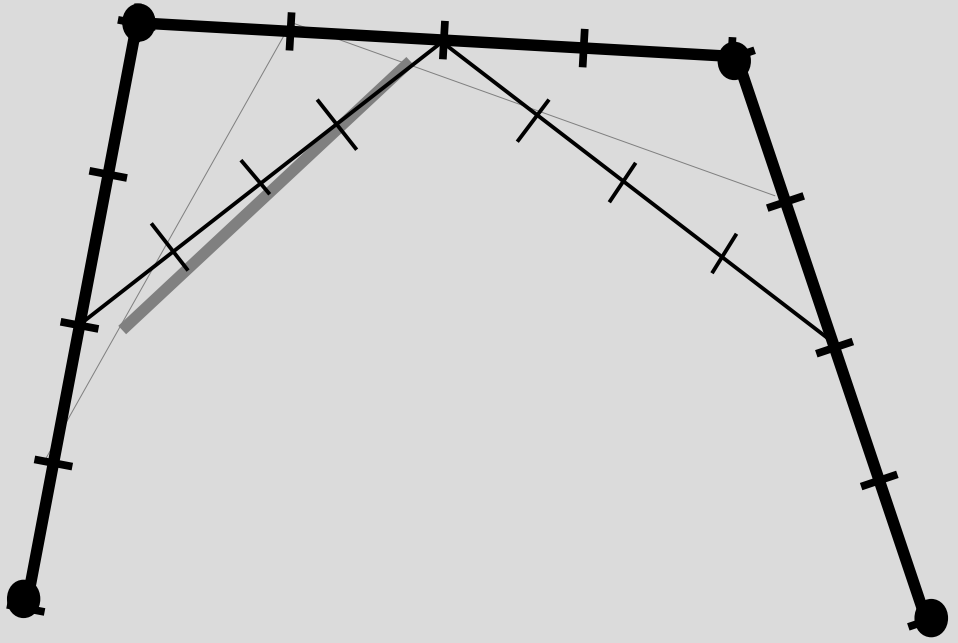
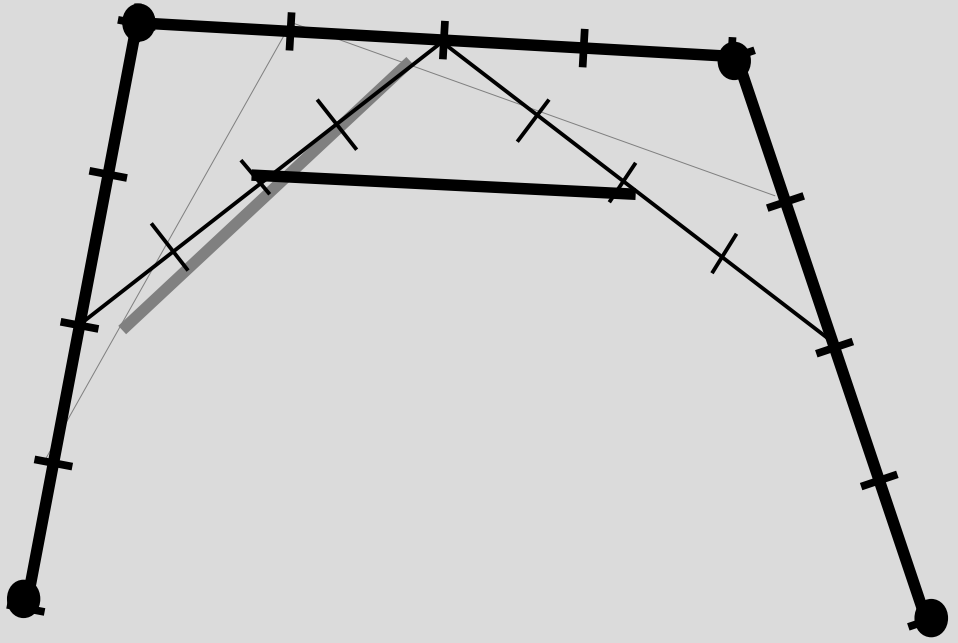


4 Point Bezier Curve

- Invented by French mathematicians/engineers around 1960
- Adobe used them in computer graphics in the 1980s



4 Point Bezier Curve

- Invented by French mathematicians/engineers around 1960
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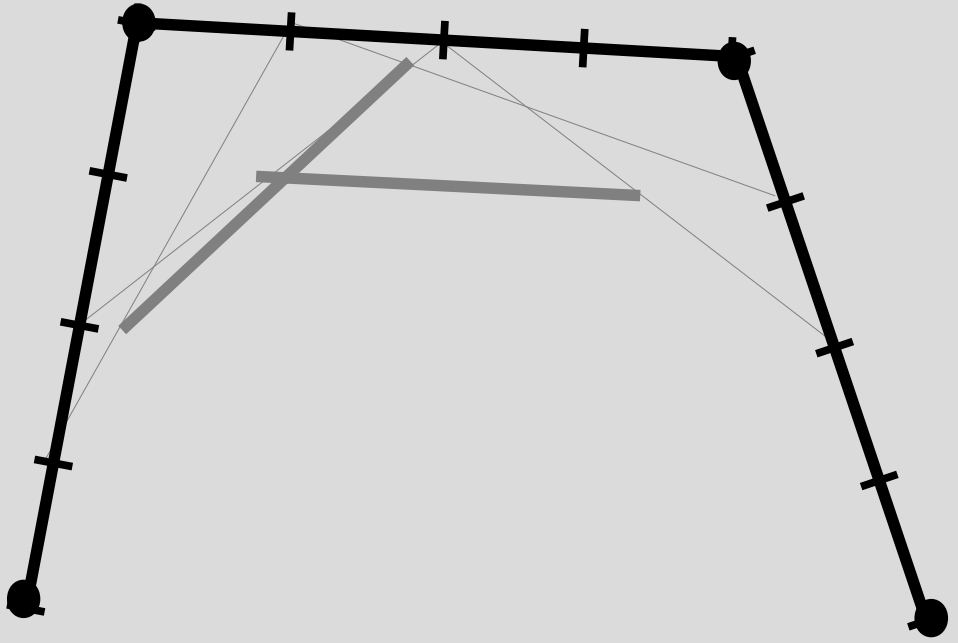

4 Point Bezier Curve

- Invented by French mathematicians/engineers around 1960
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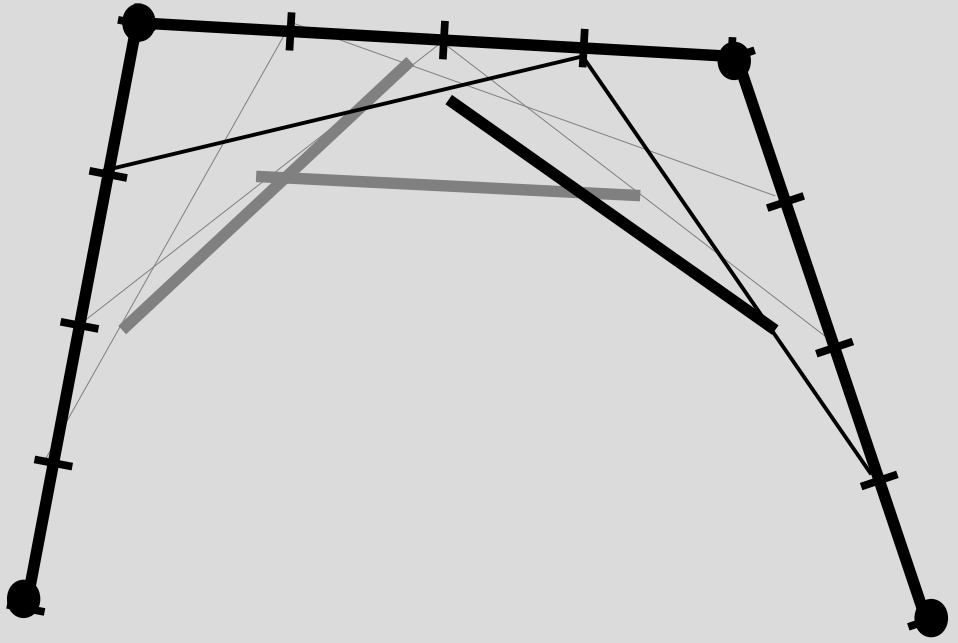

4 Point Bezier Curve

- Invented by French mathematicians/engineers around 1960
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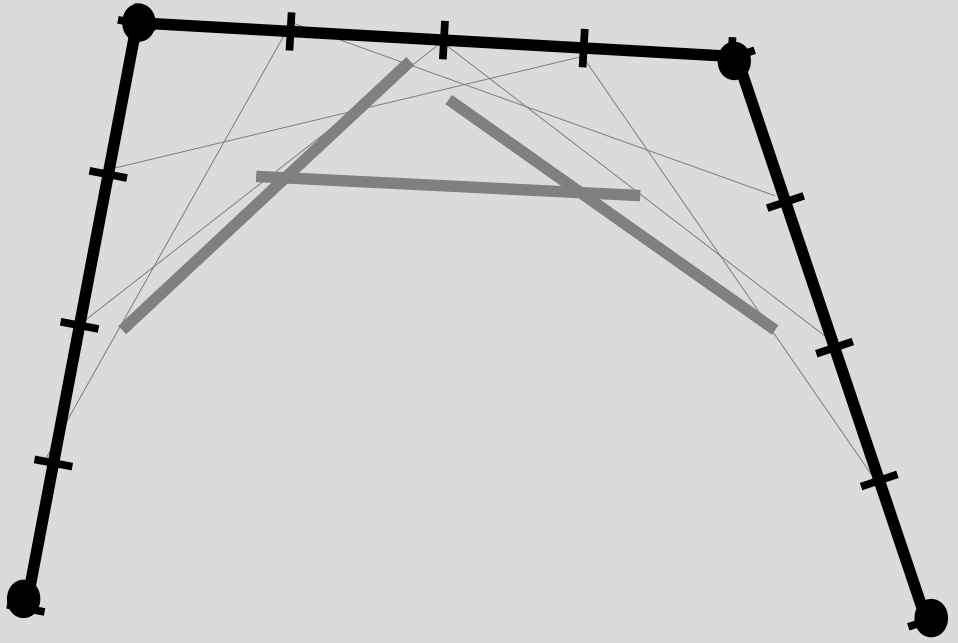

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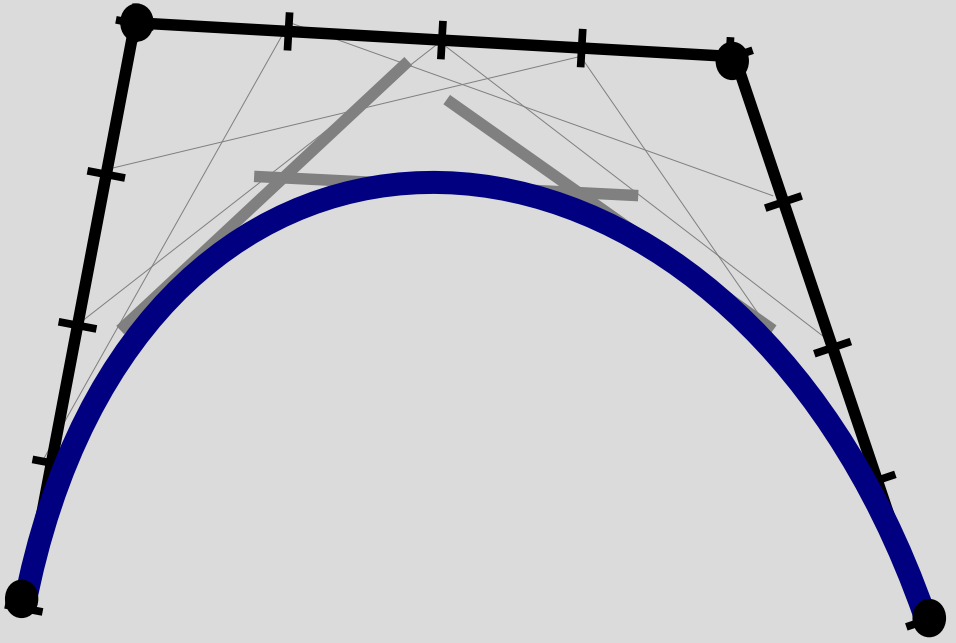
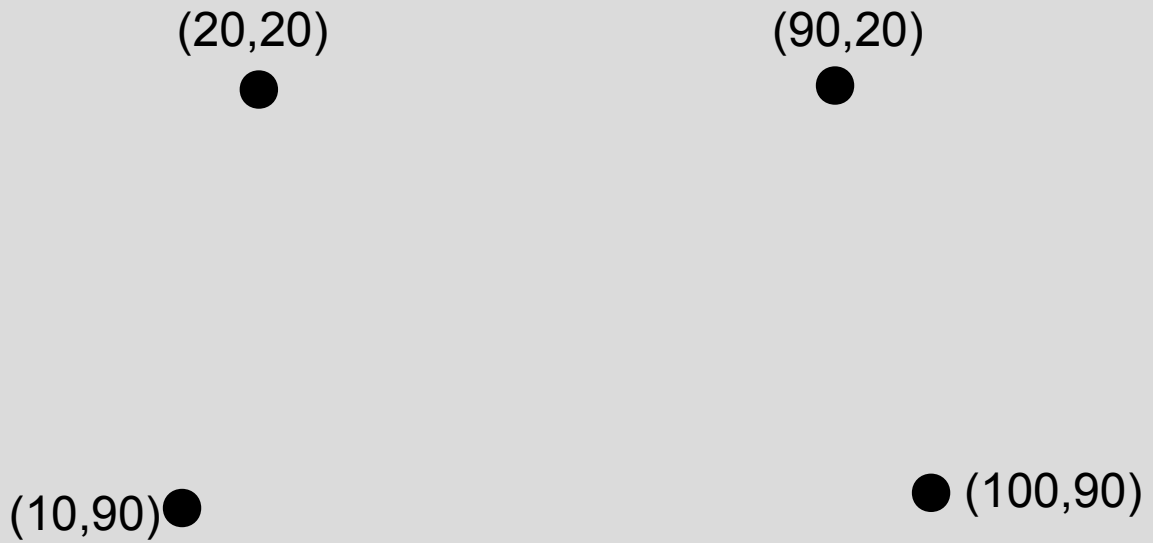
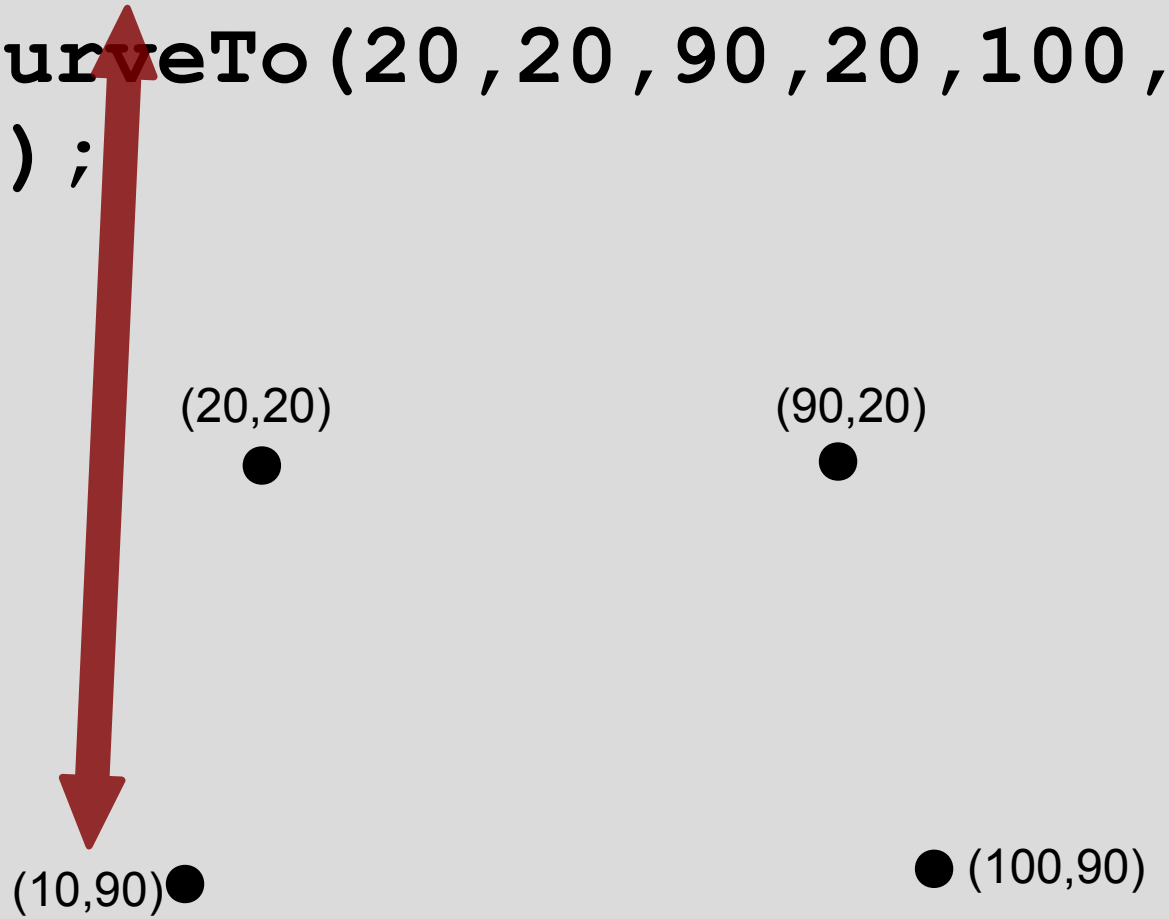


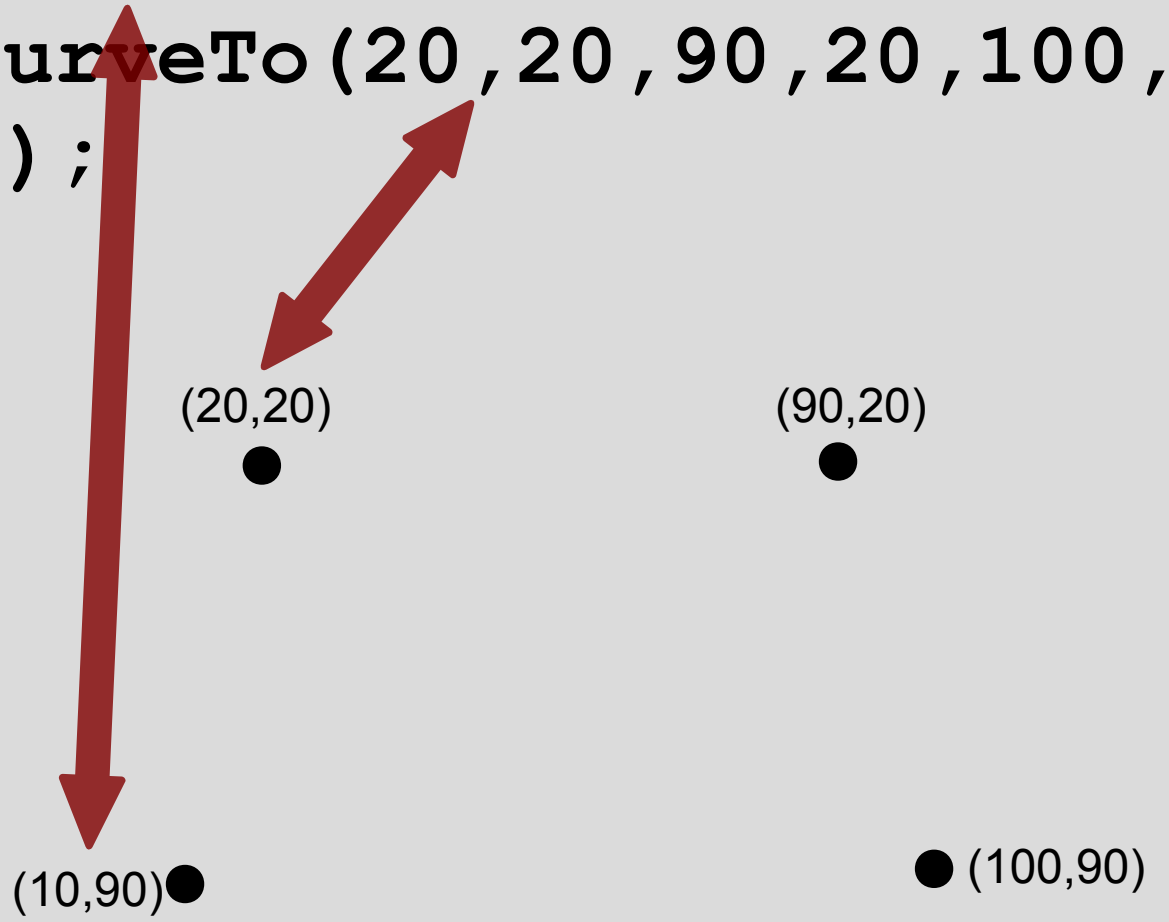
```
c.moveTo(10,90);
c.bezierCurveTo(20,20,90,20,100,90);
c.stroke();
```



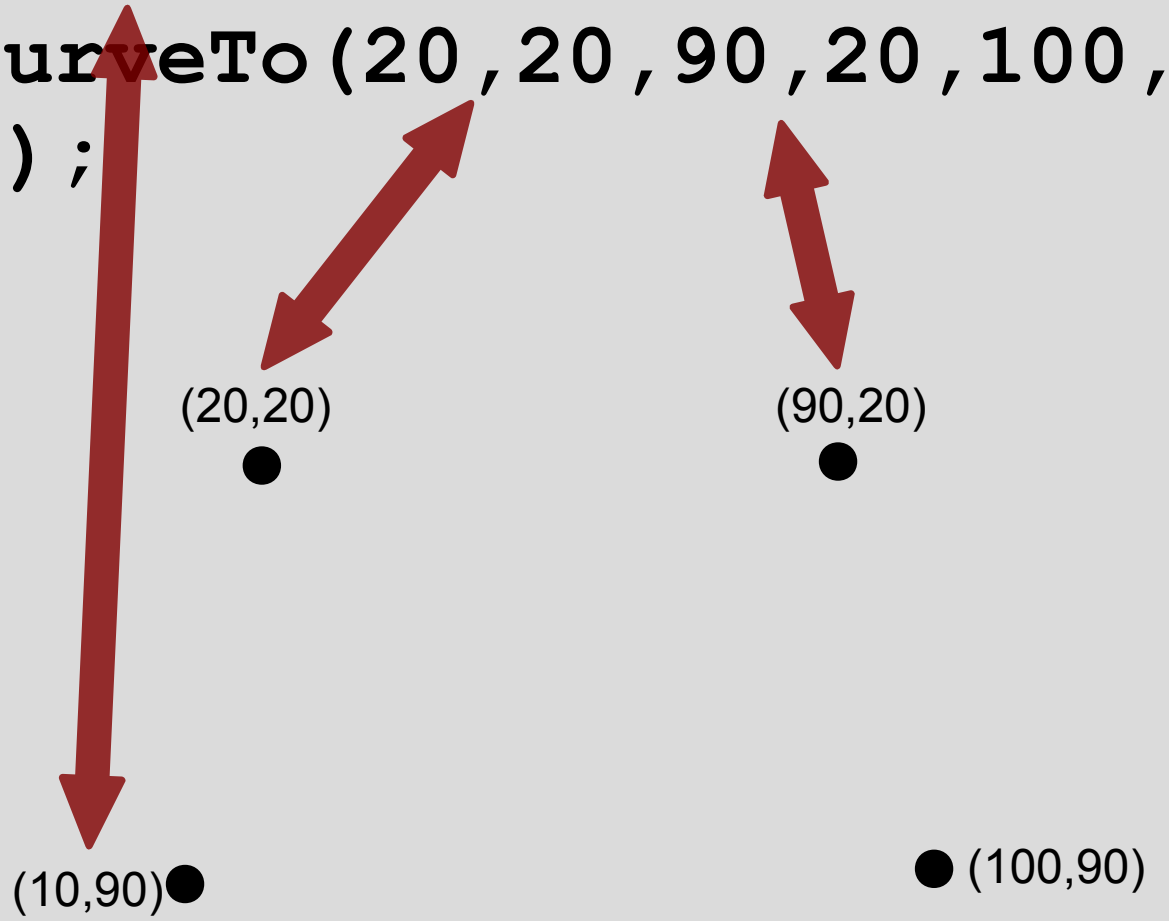
```
c.moveTo(10,90);
c.bezierCurveTo(20,20,90,20,100,90);
c.stroke();
```



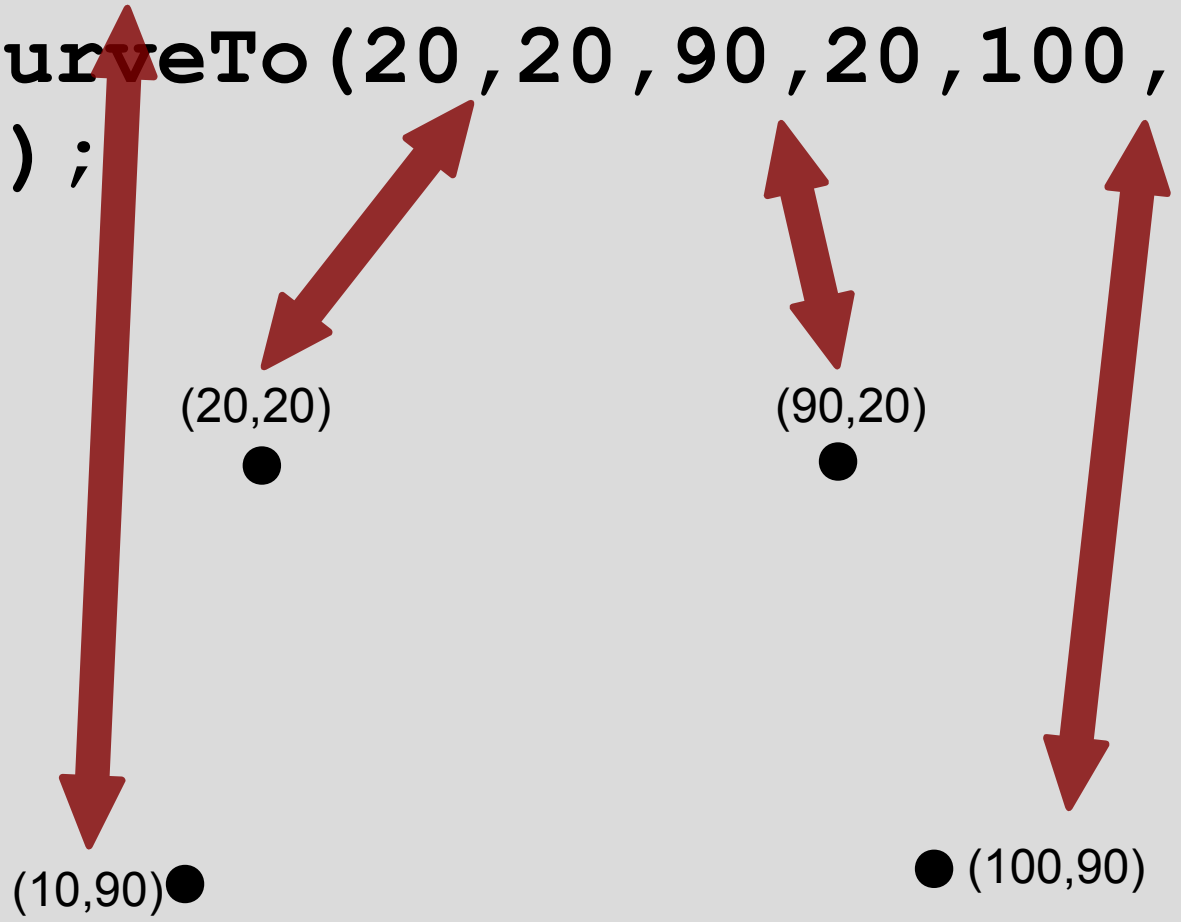
```
c.moveTo(10,90);
c.bezierCurveTo(20,20,90,20,100,90);
c.stroke();
```



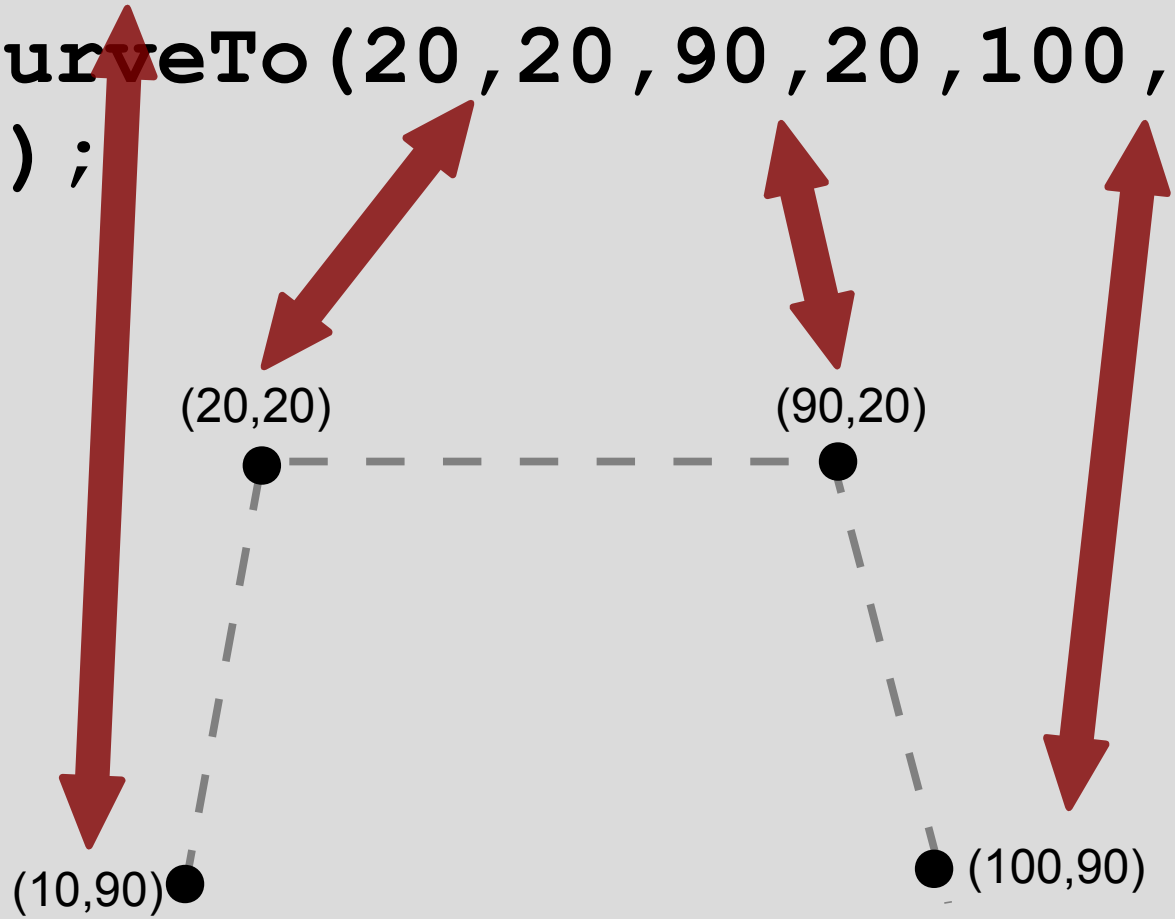
```
c.moveTo(10,90);
c.bezierCurveTo(20,20,90,20,100,90);
c.stroke();
```



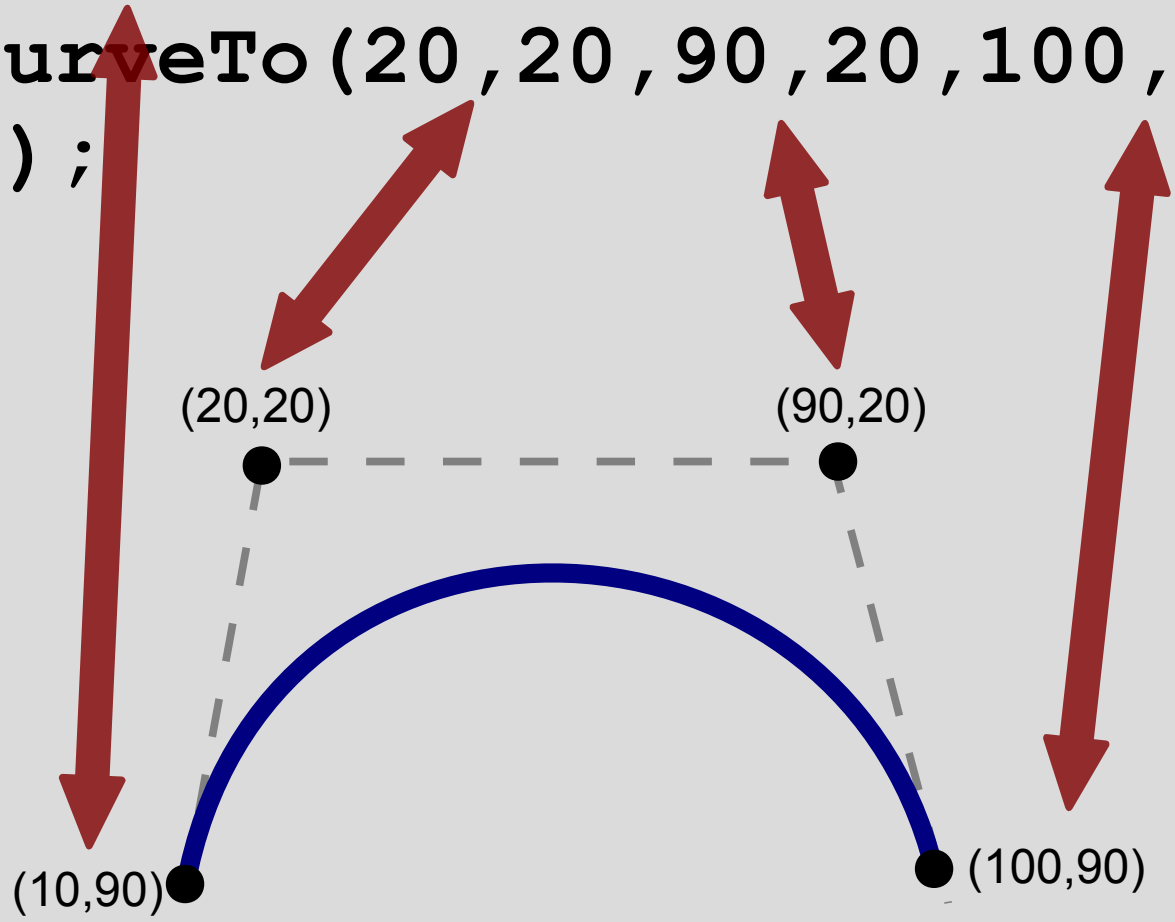
```
c.moveTo(10,90);
c.bezierCurveTo(20,20,90,20,100,90);
c.stroke();
```



```
c.moveTo(10,90);
c.bezierCurveTo(20,20,90,20,100,90);
c.stroke();
```

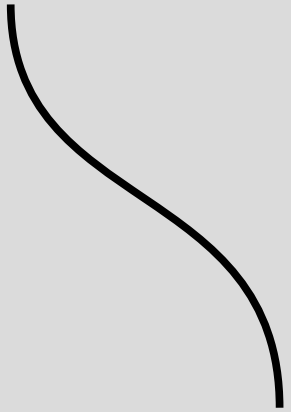


```
c.moveTo(10,90);
c.bezierCurveTo(20,20,90,20,100,90);
c.stroke();
```

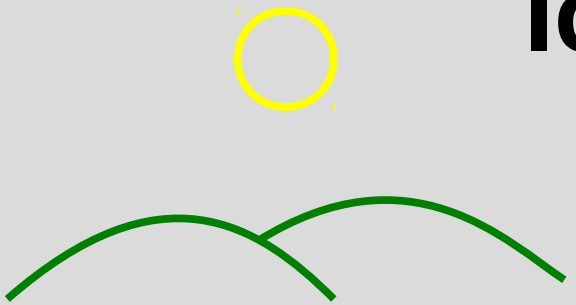


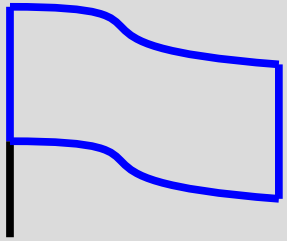
Bezier Curves

```
c.beginPath();
c.moveTo(10,10);
c.bezierCurveTo(10,50,90,50,90,90);
c.stroke();
```



Ideas



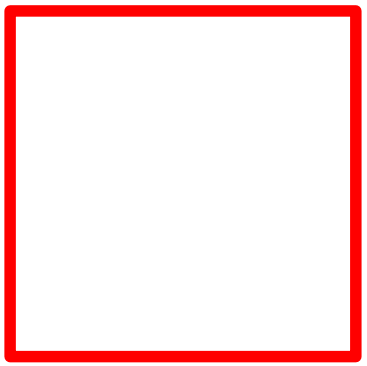


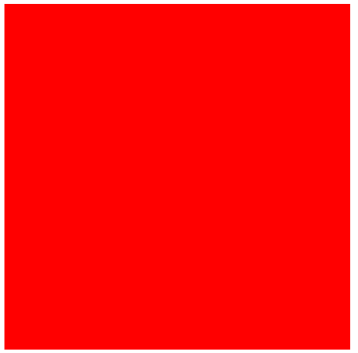
F12

ctrl - shift⇧ J

cmd⌘ - option⌥alt - C

Filled Shapes





Drawing Shapes

```
c.beginPath();
c.moveTo(5,5);
c.lineTo(90,5);
c.lineTo(90,90);
c.lineTo(5,90);
c.lineTo(5,5);

c.stroke();
```

Drawing Shapes

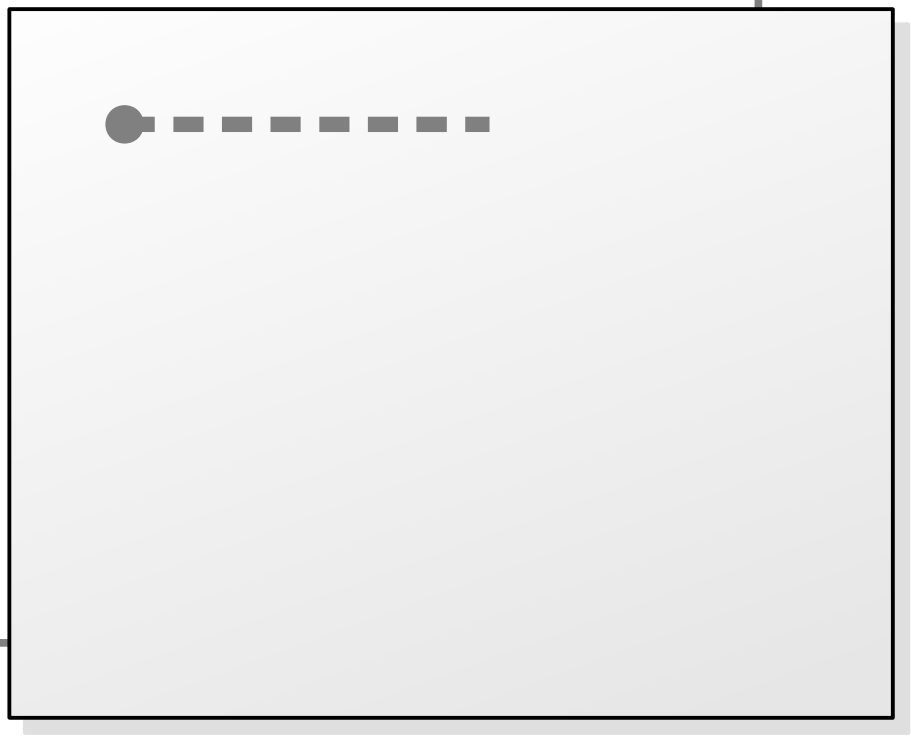
```
c.beginPath();
c.moveTo(5,5);
c.lineTo(90,5);
c.lineTo(90,90);
c.lineTo(5,90);
c.lineTo(5,5);

c.stroke();
```

Drawing Shapes

```
c.beginPath();
c.moveTo(5,5);
c.lineTo(90,5);
c.lineTo(90,90);
c.lineTo(5,90);
c.lineTo(5,5);

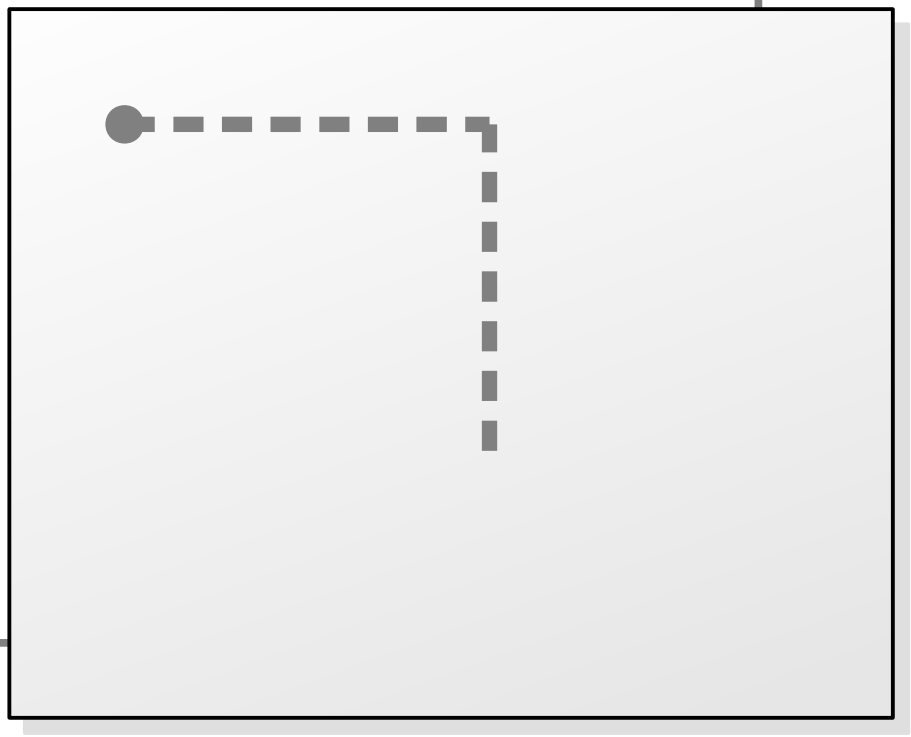
c.stroke();
```



Drawing Shapes

```
c.beginPath();
c.moveTo(5,5);
c.lineTo(90,5);
c.lineTo(90,90);
c.lineTo(5,90);
c.lineTo(5,5);

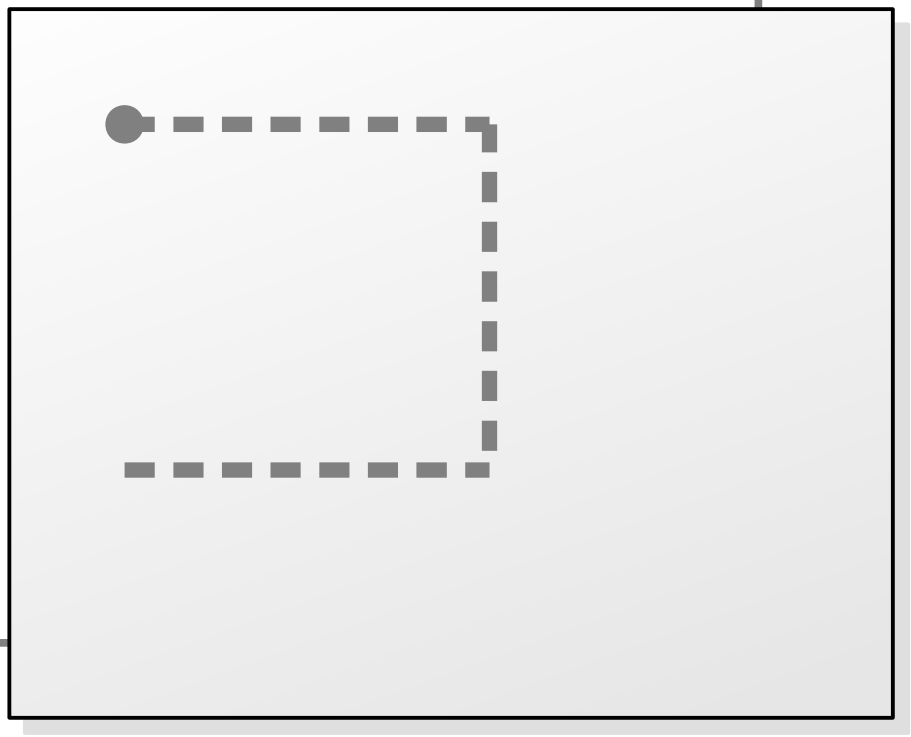
c.stroke();
```



Drawing Shapes

```
c.beginPath();
c.moveTo(5,5);
c.lineTo(90,5);
c.lineTo(90,90);
c.lineTo(5,90);
c.lineTo(5,5);

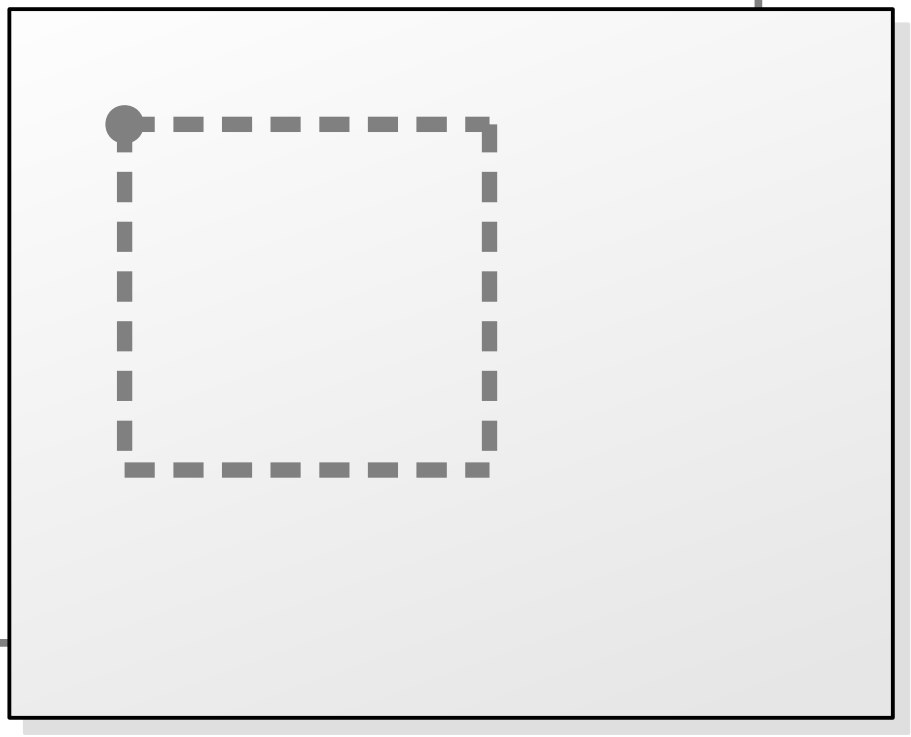
c.stroke();
```



Drawing Shapes

```
c.beginPath();
c.moveTo(5,5);
c.lineTo(90,5);
c.lineTo(90,90);
c.lineTo(5,90);
c.lineTo(5,5);

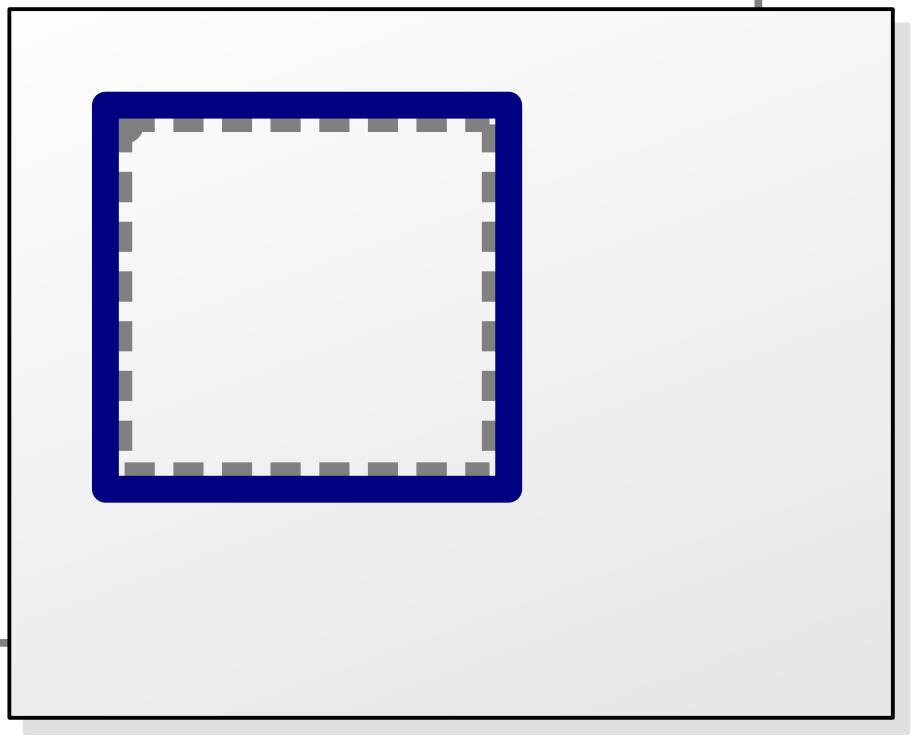
c.stroke();
```



Drawing Shapes

```
c.beginPath();
c.moveTo(5,5);
c.lineTo(90,5);
c.lineTo(90,90);
c.lineTo(5,90);
c.lineTo(5,5);

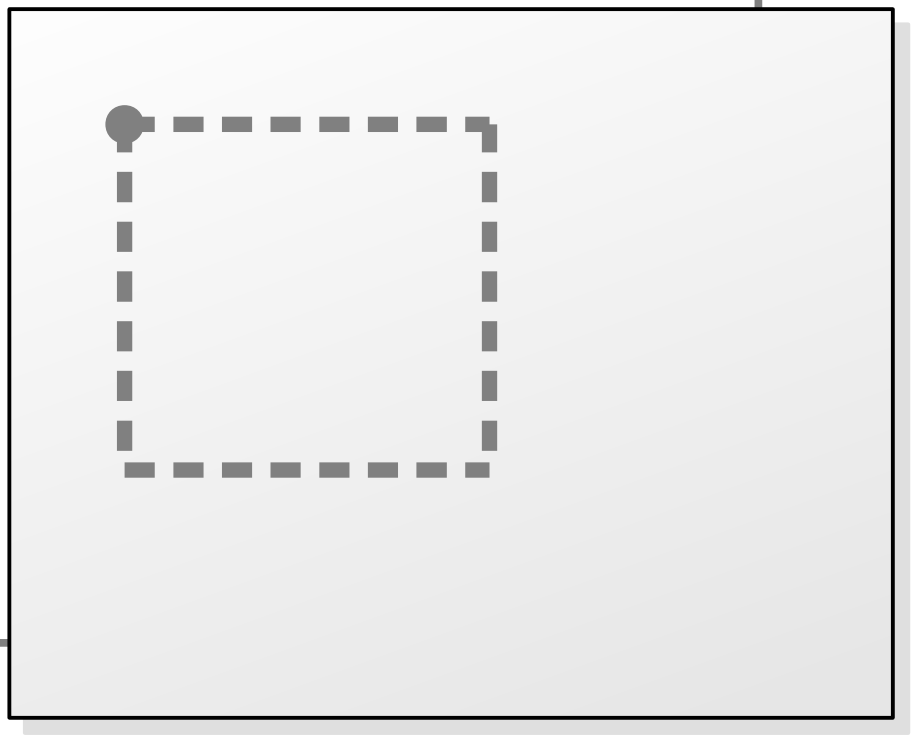
c.stroke();
```



Fills

```
c.beginPath();
c.moveTo(5,5);
c.lineTo(90,5);
c.lineTo(90,90);
c.lineTo(5,90);
c.lineTo(5,5);

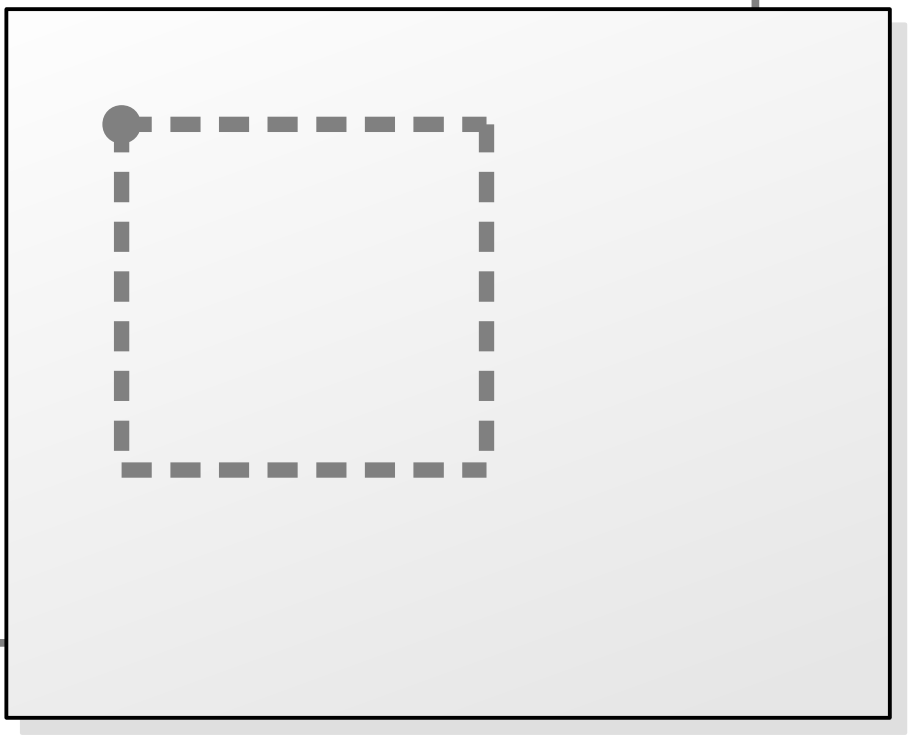
c.stroke();
```



Fills

```
c.beginPath();
c.moveTo(5,5);
c.lineTo(90,5);
c.lineTo(90,90);
c.lineTo(5,90);
c.lineTo(5,5);

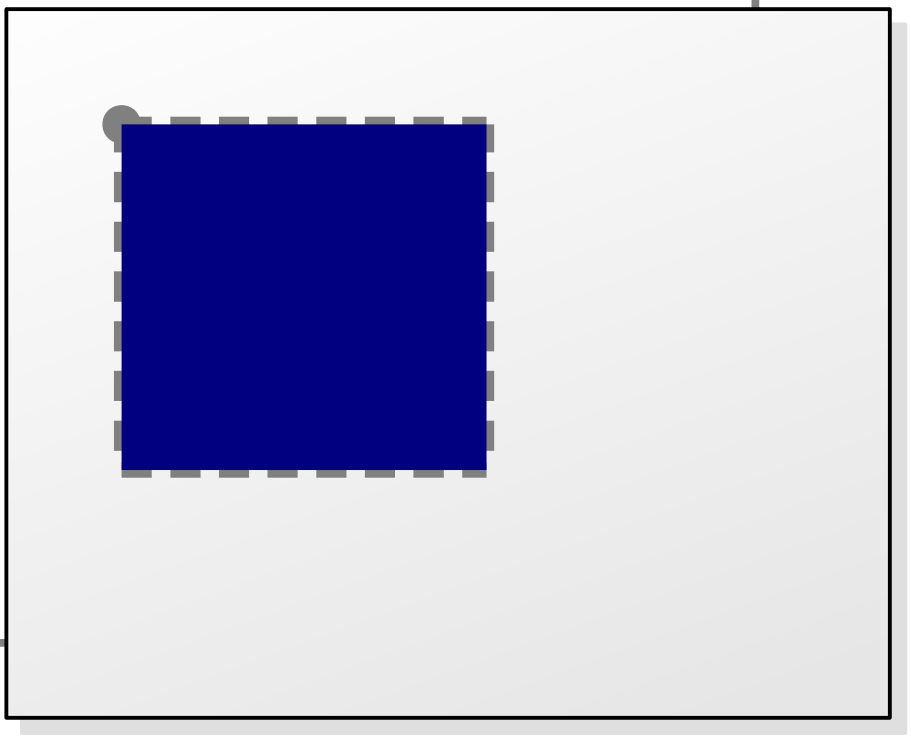
c.stroke();
c.fill();
```



Fills

```
c.beginPath();
c.moveTo(5,5);
c.lineTo(90,5);
c.lineTo(90,90);
c.lineTo(5,90);
c.lineTo(5,5);

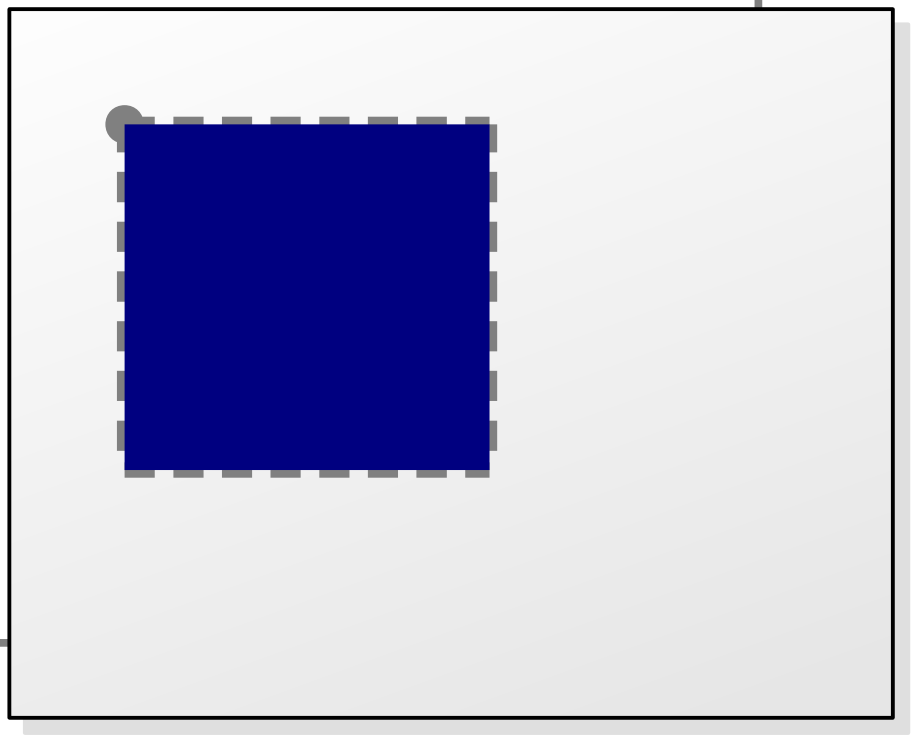
c.stroke();
c.fill();
```



Colored Fills

```
c.beginPath();
c.moveTo(5,5);
c.lineTo(90,5);
c.lineTo(90,90);
c.lineTo(5,90);
c.lineTo(5,5);

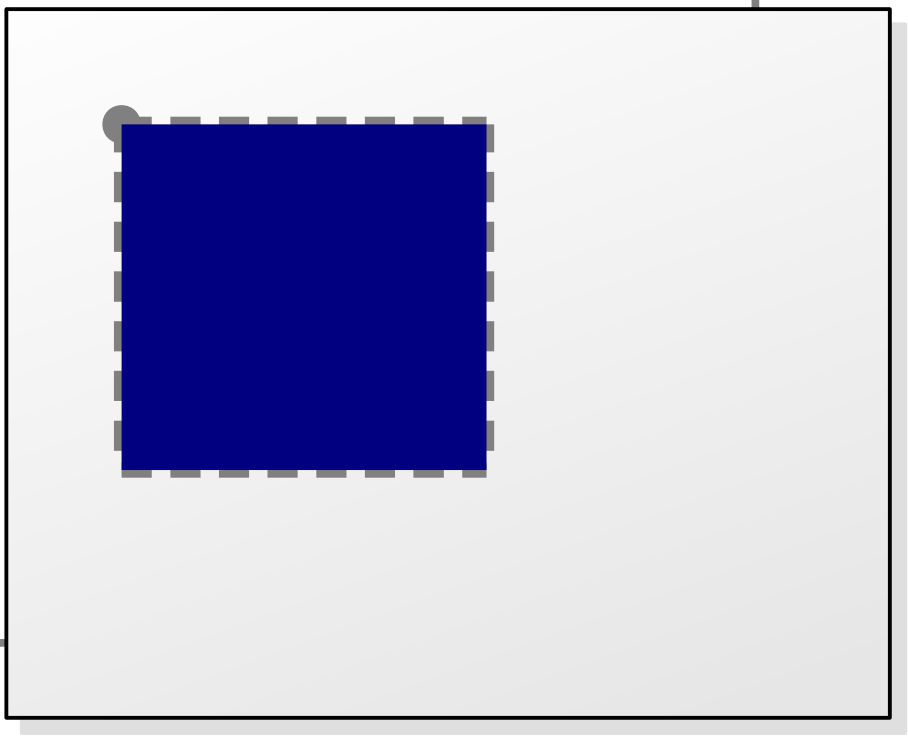

c.fill();
```



Colored Fills

```
c.beginPath();
c.moveTo(5,5);
c.lineTo(90,5);
c.lineTo(90,90);
c.lineTo(5,90);
c.lineTo(5,5);

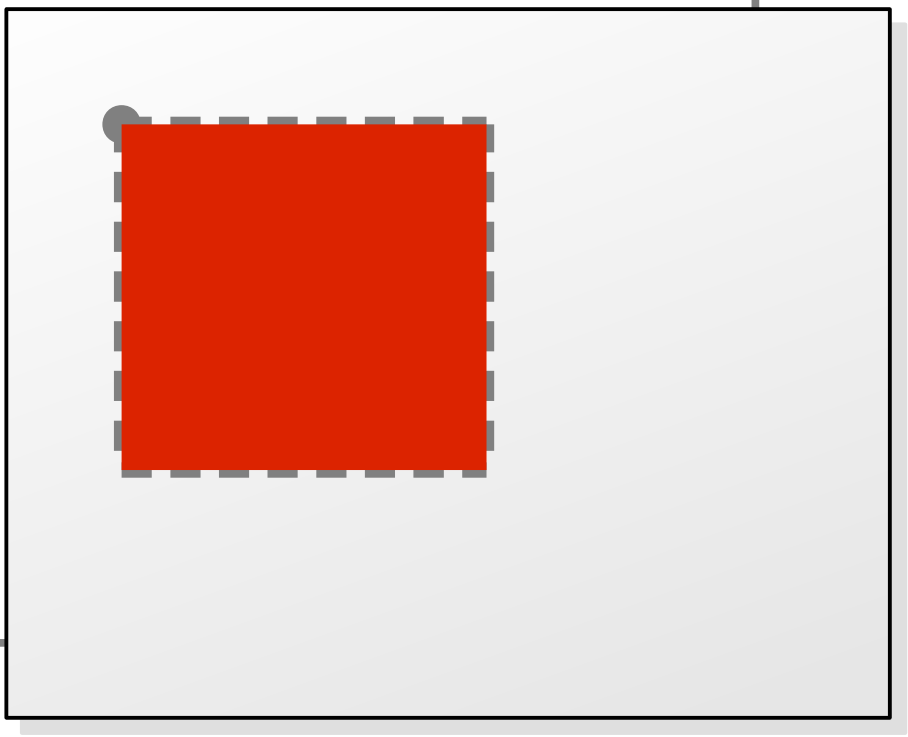
c.fillStyle = 'red';
c.fill();
```



Colored Fills

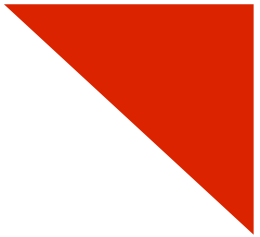
```
c.beginPath();
c.moveTo(5,5);
c.lineTo(90,5);
c.lineTo(90,90);
c.lineTo(5,90);
c.lineTo(5,5);

c.fillStyle = 'red';
c.fill();
```

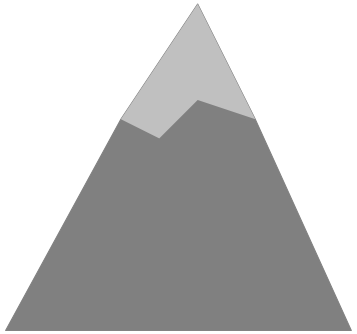


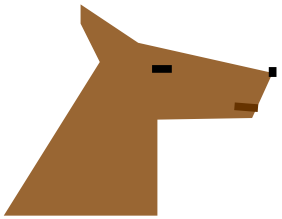
Filled Shapes

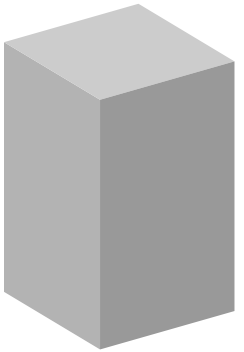
```
c.beginPath();
c.moveTo(20,20);
c.lineTo(90,20);
c.lineTo(90,90);
c.fillStyle='red';
c.fill();
```



Ideas







black
blue
brown
green
orange
purple
red
white
yellow
pink
gray

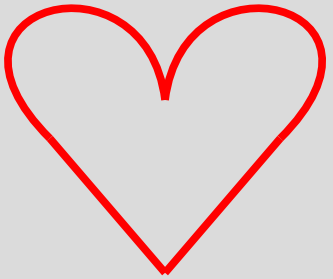
F12

ctrl - shift⇧ J

cmd⌘ - option⌥alt - C

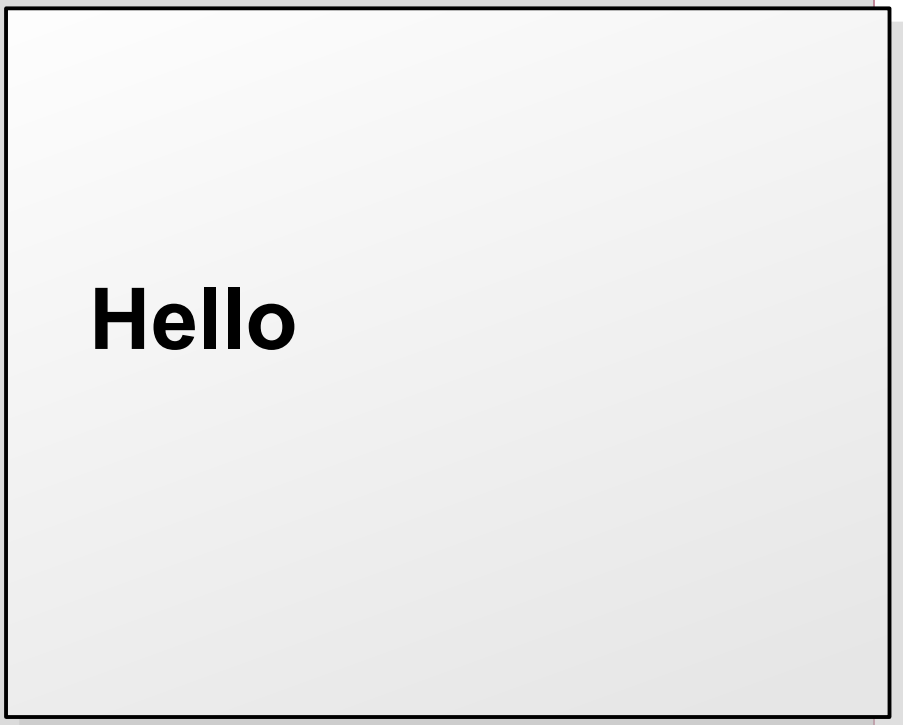
Text

Will you go to the dance with me?



Writing Things

```
c.fillText('Hello', 20, 100);
```

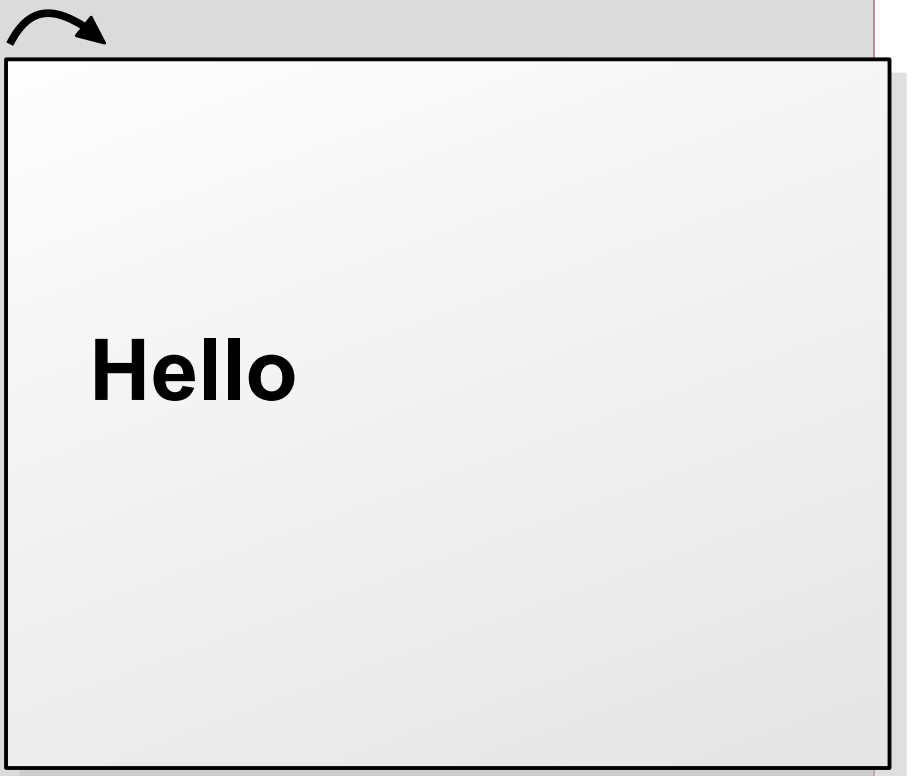


Writing Things

```
c.fillText('Hello', 20, 100);
```

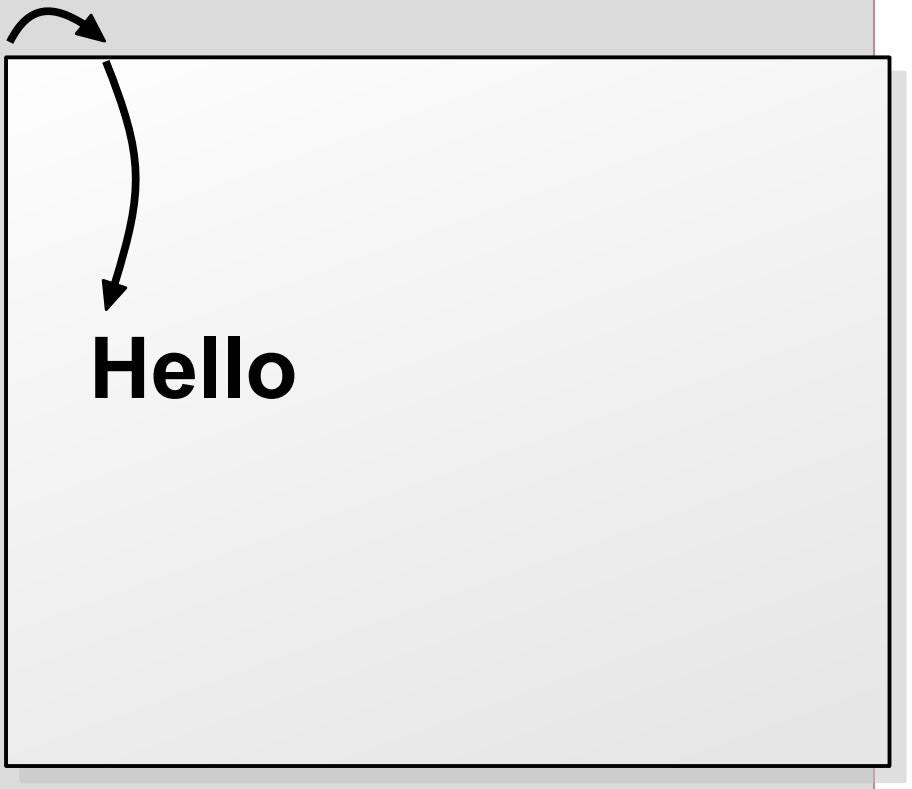
Writing Things

```
c.fillText('Hello', 20, 100);
```



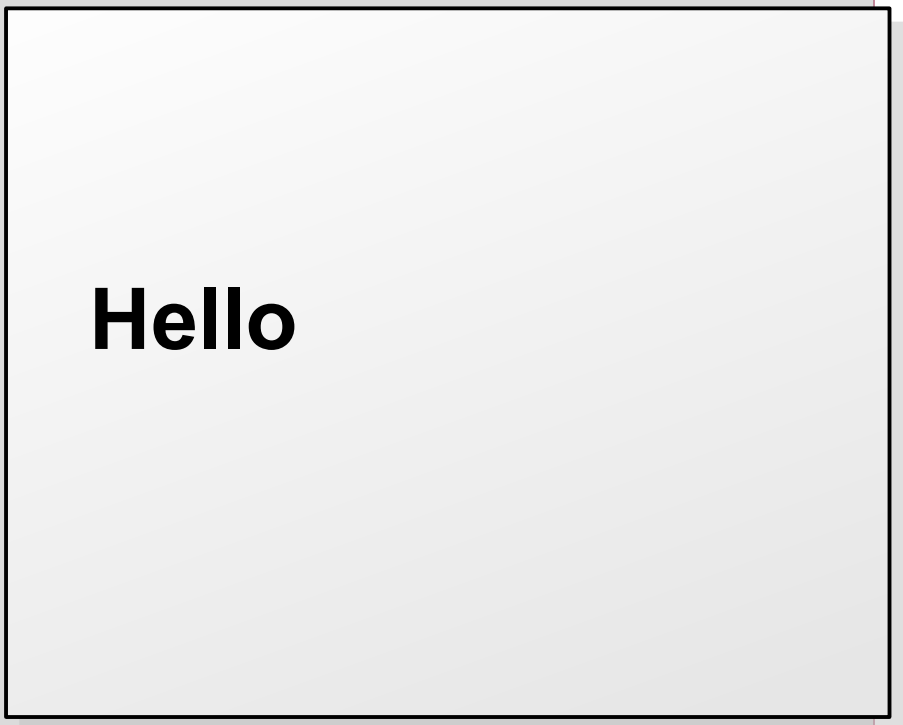
Writing Things

```
c.fillText('Hello', 20, 100);
```



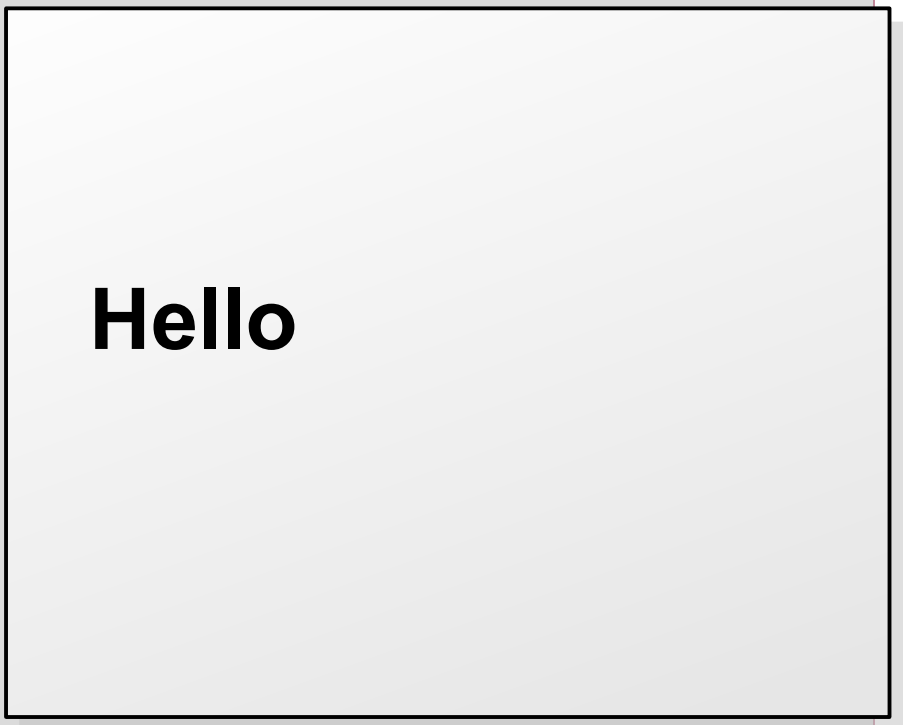
Writing Things

```
c.font = '20px';
c.fillText('Hello', 20, 100);
```



Writing Things

```
c.font = '20px';
c.fillText('Hello', 20, 100);
```



Writing Things

```
c.font = '20px';
c.fillText('Hello', 20, 100);
```

Writing Things

```
c.font = '20px serif';
c.fillText('Hello', 20, 100);
```

Writing Things

```
c.font = '20px serif';
c.fillText('Hello', 20, 100);
```

Text

```
c.fillStyle='blue';
c.font = '20px sans-serif';
c.fillText('Hello', 20, 100);
```

Hello

Ideas

Red

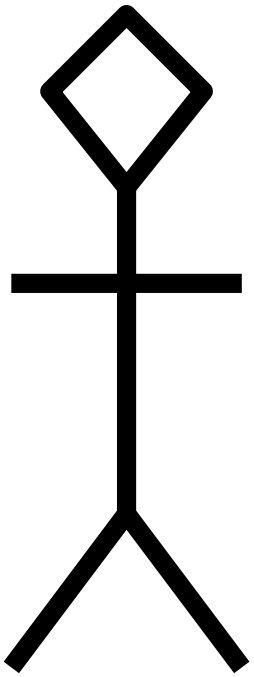

F12



ctrl - shift⇧ J


cmd⌘ - option⌥alt - C

Drawing is Hard



Images

```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {



c.drawImage(a,100,50);



});
```

Images

```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {



c.drawImage(a,100,50);



});
```

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Images

```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {


c.drawImage(a,100,50);



});
```

Changing Images

```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {



c.drawImage(a,100,50);



});
```

Changing Images

```
a = new Image();
a.src = 'http://e.ecli.ca/mona.jpg';

wait(function() {



c.drawImage(a,100,50);



});
```

Changing Images

```
a = new Image();  http://o.ooli.ca/ele.png
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {



c.drawImage(a,100,50);



});
```

Changing Images

```
a = new Image();
a.src = 'http://o.ooli.ca/ele.png';

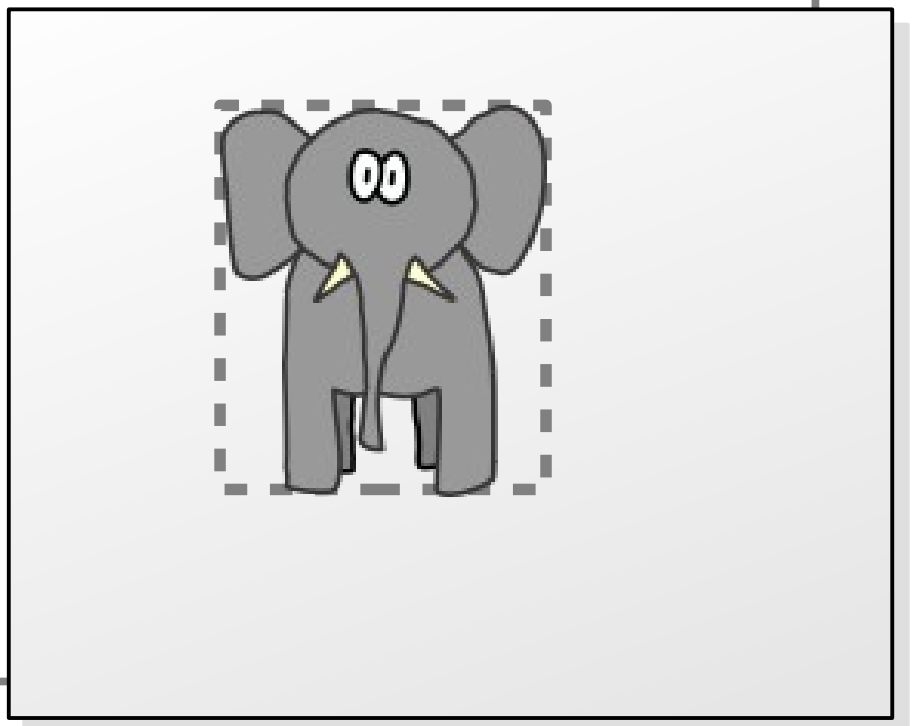
wait(function() {



c.drawImage(a,100,50);



});
```



Placing Images

```
a = new Image();
a.src = 'http://o.ooli.ca/ele.png';

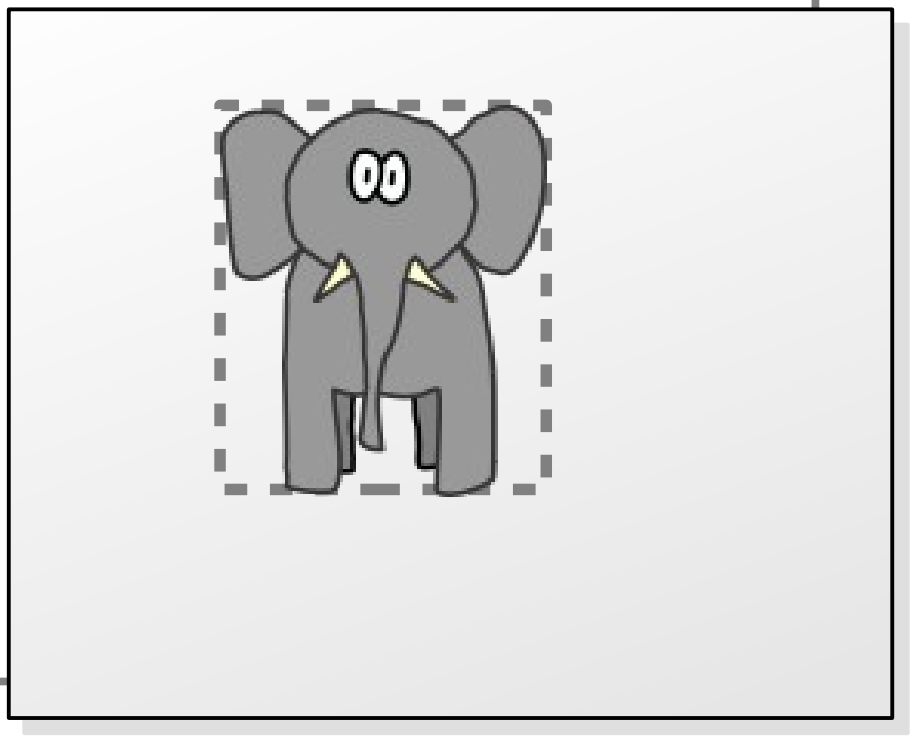
wait(function() {



c.drawImage(a,100,50);



});
```



Placing Images

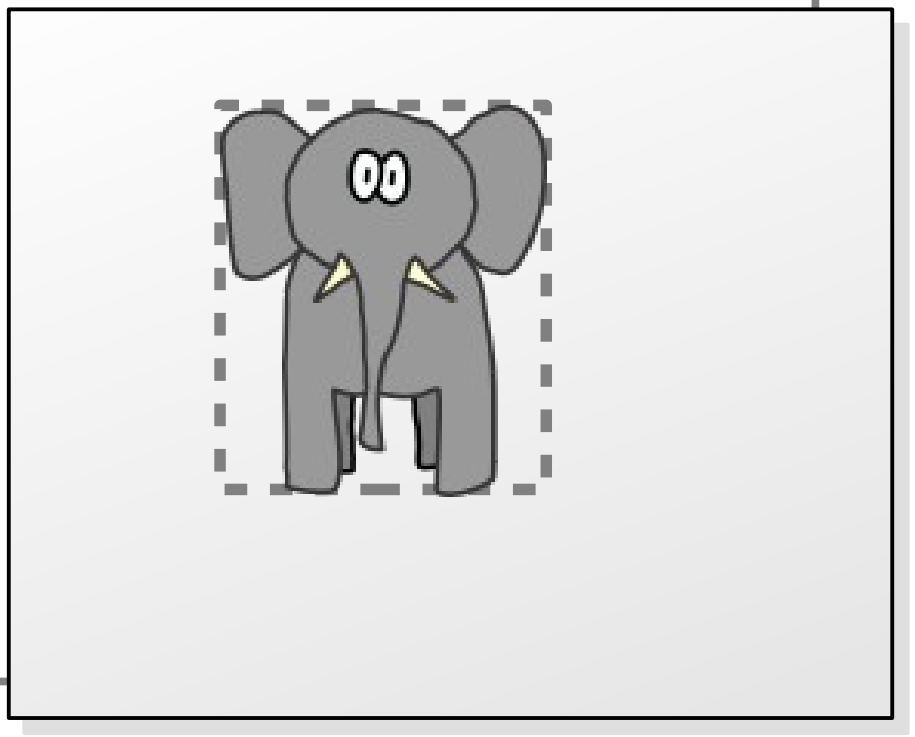
```
a = new Image();
a.src = 'http://o.ooli.ca/ele.png';

wait(function() {


c.drawImage(a,100,50);



});
```



Placing Images

```
a = new Image();
a.src = 'http://o.ooli.ca/ele.png';

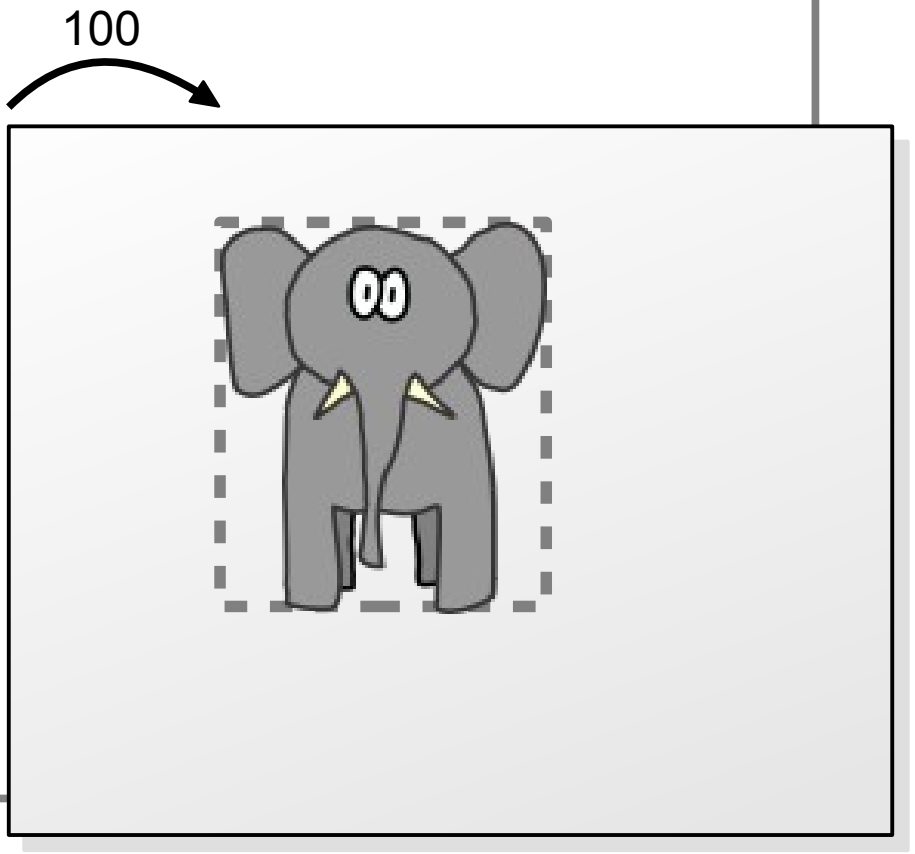
wait(function() {



c.drawImage(a,100,50);



});
```



Placing Images

```
a = new Image();
a.src = 'http://o.ooli.ca/ele.png';

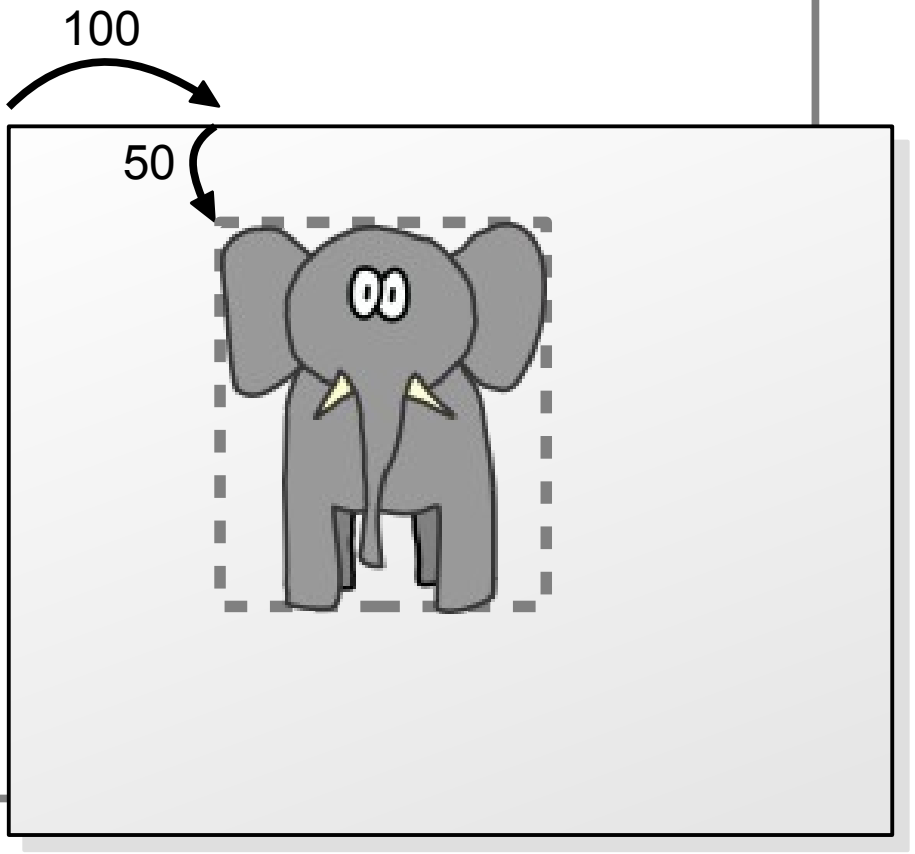
wait(function() {



c.drawImage(a,100,50);



});
```



Placing Images

```
a = new Image();
a.src = 'http://o.ooli.ca/ele.png';

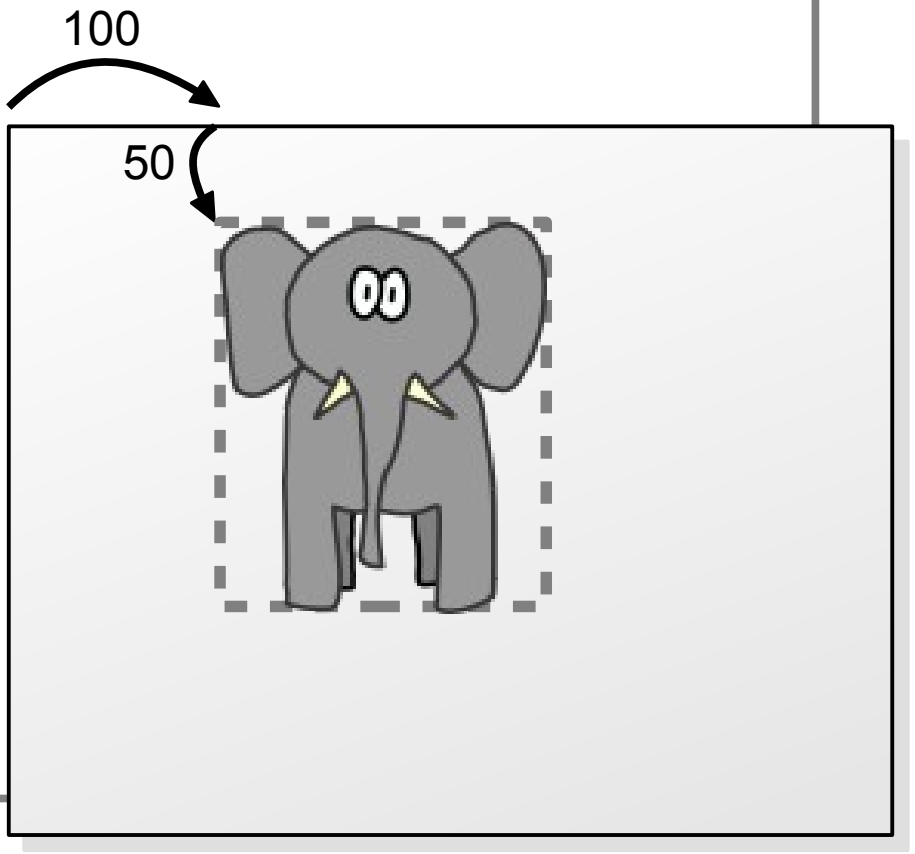
wait(function() {



c.drawImage(a,100,90);



});
```



Placing Images

```
a = new Image();
a.src = 'http://o.ooli.ca/ele.png';

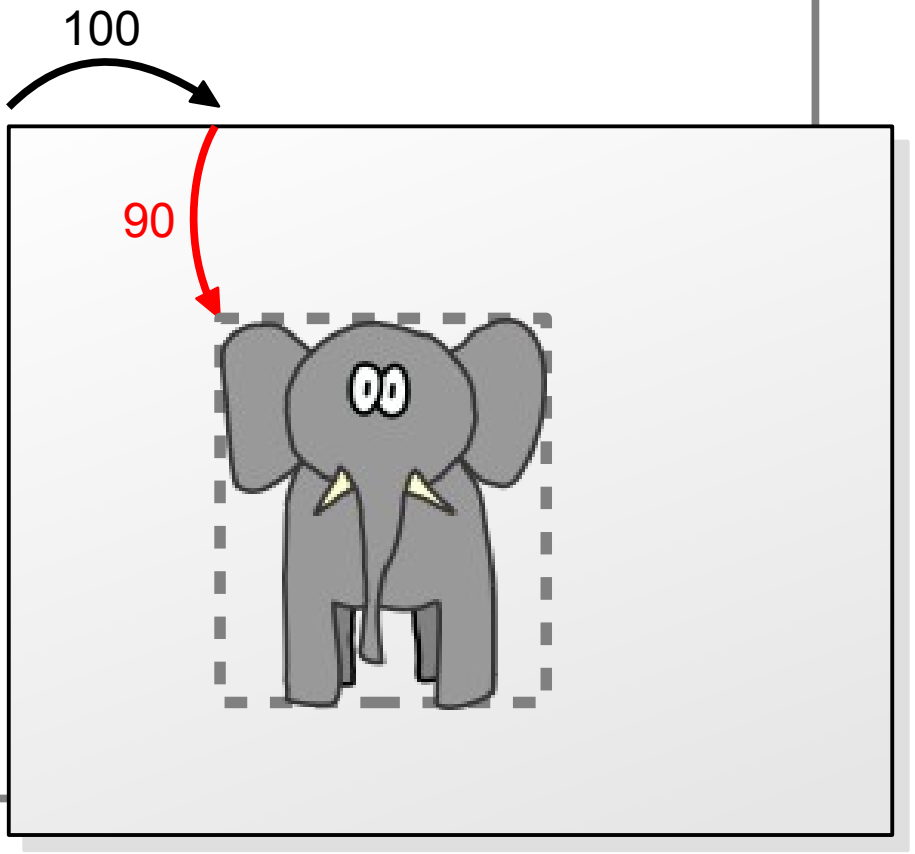
wait(function() {



c.drawImage(a,100,90);



});
```



Two Images

```
a = new Image();
a.src = 'http://o.ooli.ca/ele.png';

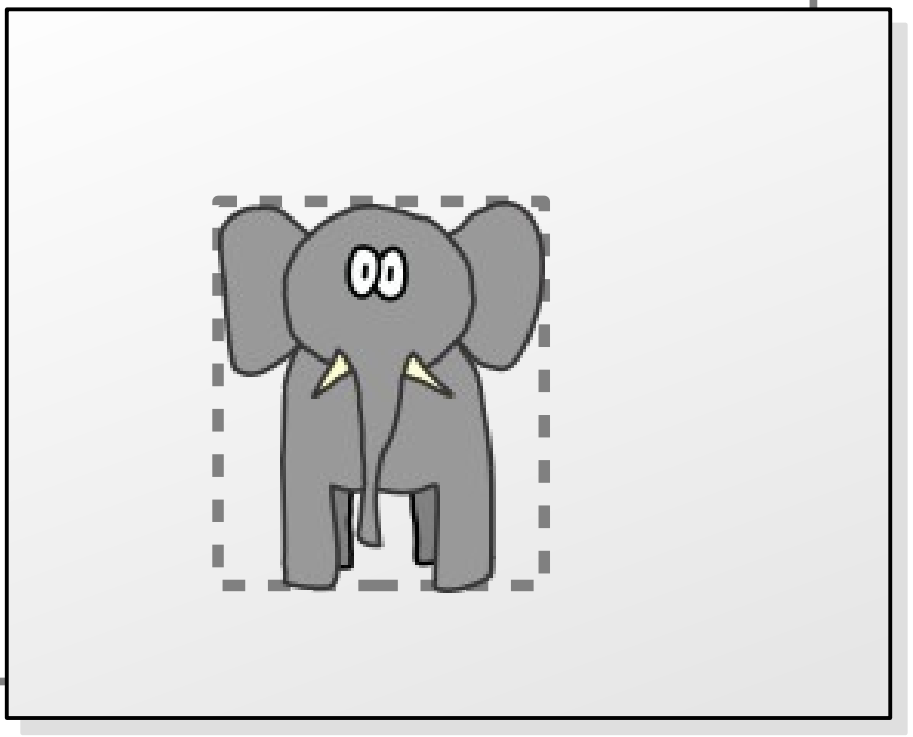
wait(function() {



c.drawImage(a,100,90);



});
```



Two Images

```
a = new Image();
a.src = 'http://o.ooli.ca/ele.png';

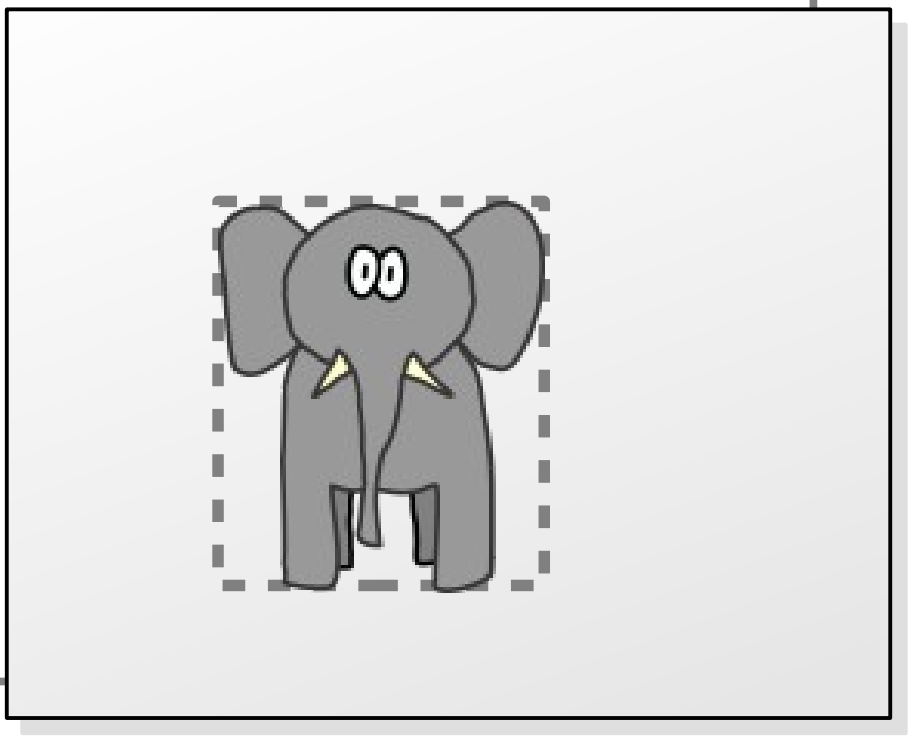
wait(function() {



c.drawImage(a,100,90);



});
```



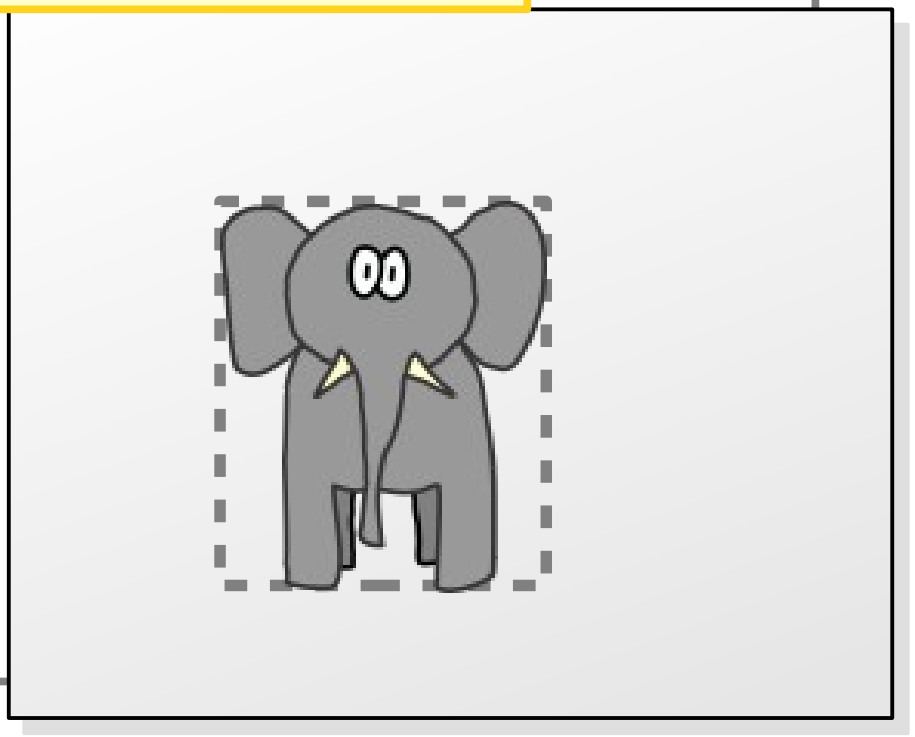
Two Images

```
a = new Image();
a.src = 'http://o.ooli.ca/ele.png';
b = new Image();
b.src = 'http://o.ooli.ca/mona.jpg';
wait(function() {


c.drawImage(a,100,90);



});
```



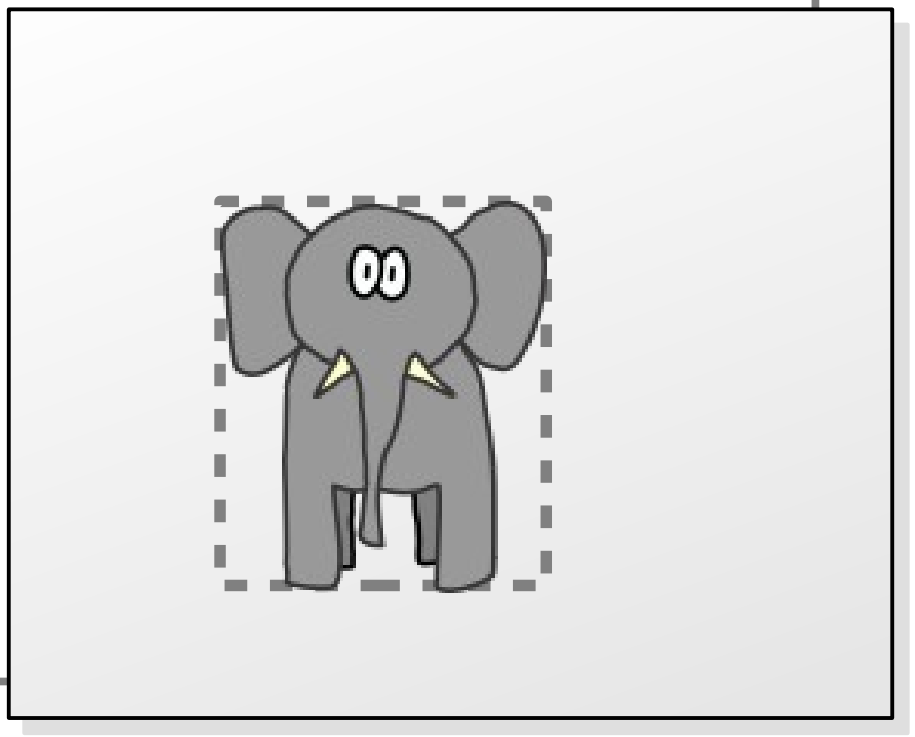
Two Images

```
a = new Image();
a.src = 'http://o.ooli.ca/ele.png';
b = new Image();
b.src = 'http://o.ooli.ca/mona.jpg';
wait(function() {


c.drawImage(a,100,90);



});
```

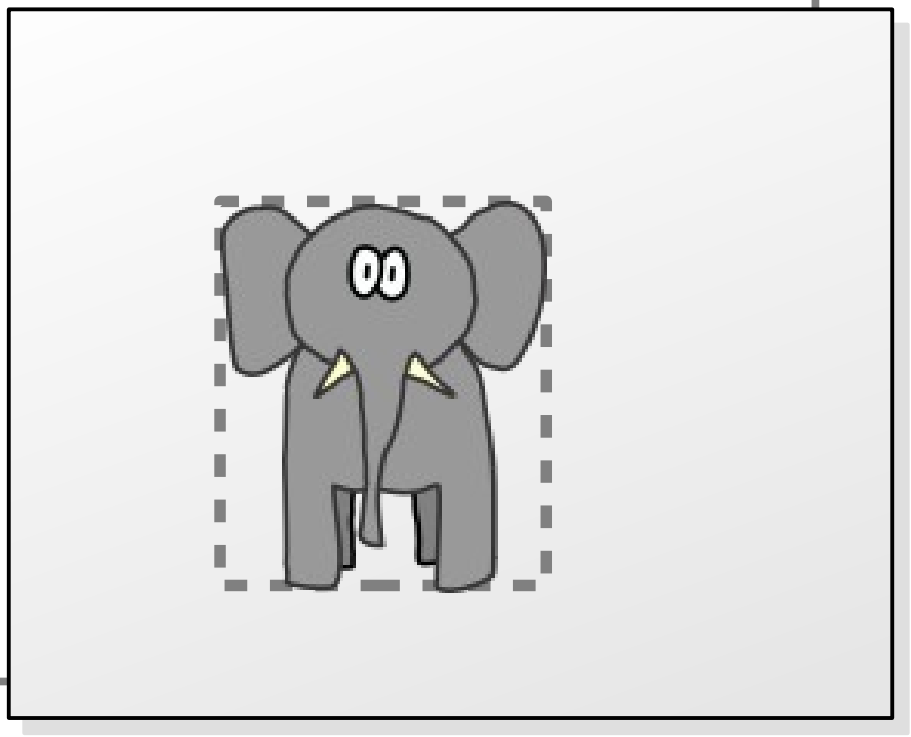


Two Images

```
a = new Image();
a.src = 'http://o.ooli.ca/ele.png';
b = new Image();
b.src = 'http://o.ooli.ca/mona.jpg';
wait(function() {


c.drawImage(a,100,90);
c.drawImage(b,10,10);


});
```

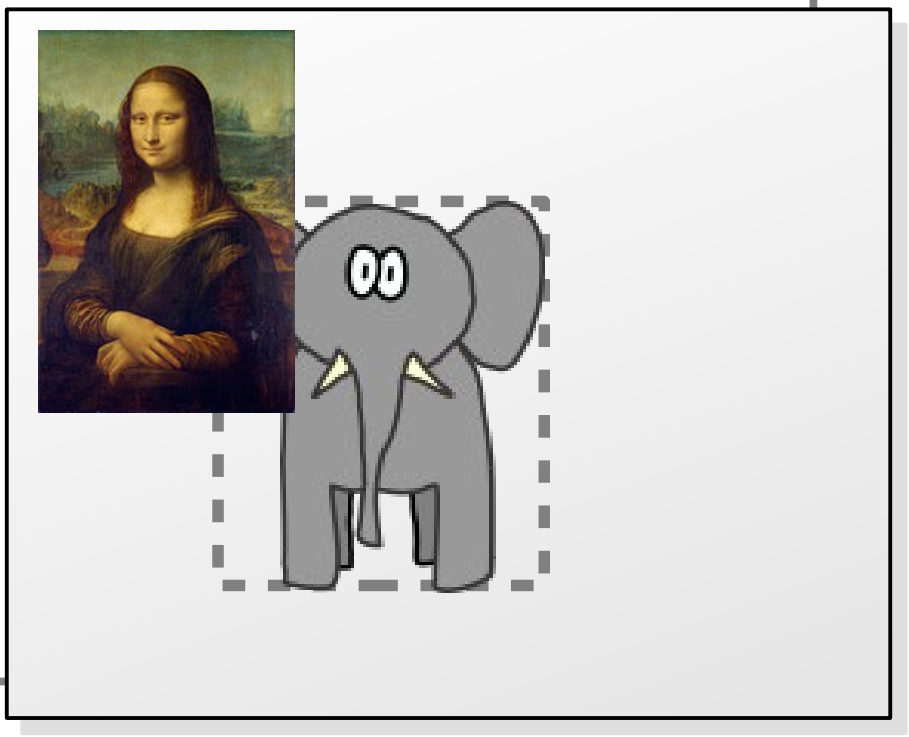


Two Images

```
a = new Image();
a.src = 'http://o.ooli.ca/ele.png';
b = new Image();
b.src = 'http://o.ooli.ca/mona.jpg';
wait(function() {


c.drawImage(a,100,90);
c.drawImage(b,10,10);


});
```



Click on Run If It Gets Stuck

Images

```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

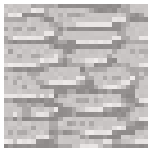
wait(function() {

c.drawImage(a,100,50);

});
```

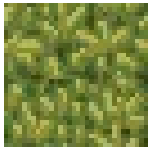
Program

http://o.ooli.ca/



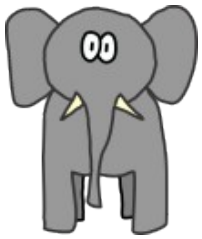
stone.png

brick.png



grass.png

http://o.ooli.ca/



ele.png

dog.png

person.png

car_top.png

mona.jpg

tree.png

leaves.png

F12

ctrl - shift⇧ J

cmd⌘ - option⌥alt - C

Where to Get Images

- Find an image
- Right-click (ctrl-click)
- Copy
  - Copy Image URL
  - Copy Image Location
  - Copy Image Address
  - Properties...Address
- Paste it

- Or upload your own images!

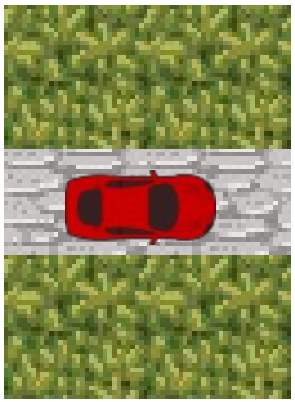
```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {

c.drawImage(a,100,50);

});
```

Ideas



- Find an image
- Right-click (ctrl-click)
- Copy
  - Copy Image URL
  - Copy Image Location
  - Copy Image Address
  - Properties...Address
- Paste it

```
http://o.ooli.ca/ele.png
http://o.ooli.ca/dog.png
http://o.ooli.ca/person.png
http://o.ooli.ca/car_top.png
http://o.ooli.ca/mona.jpg
http://o.ooli.ca/tree.png
http://o.ooli.ca/leaves.png
http://o.ooli.ca/stone.png
http://o.ooli.ca/brick.png
http://o.ooli.ca/grass.png
```


F12


ctrl - shift⇧ J

cmd⌘ - option⌥alt - C

Animation Using HTML5 Canvas

- Go to http://o.ooli.ca/canvasjsbin
- *Presentation copy http://*









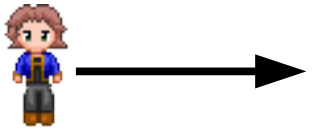




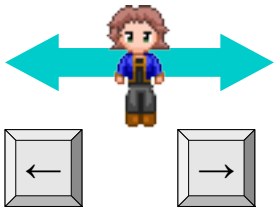

Overview

- Main Topics
  - Images

  - Basic Animation

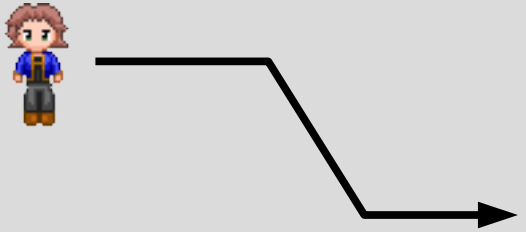


  - Keyboard Control



- Optional
  - Affine Transforms

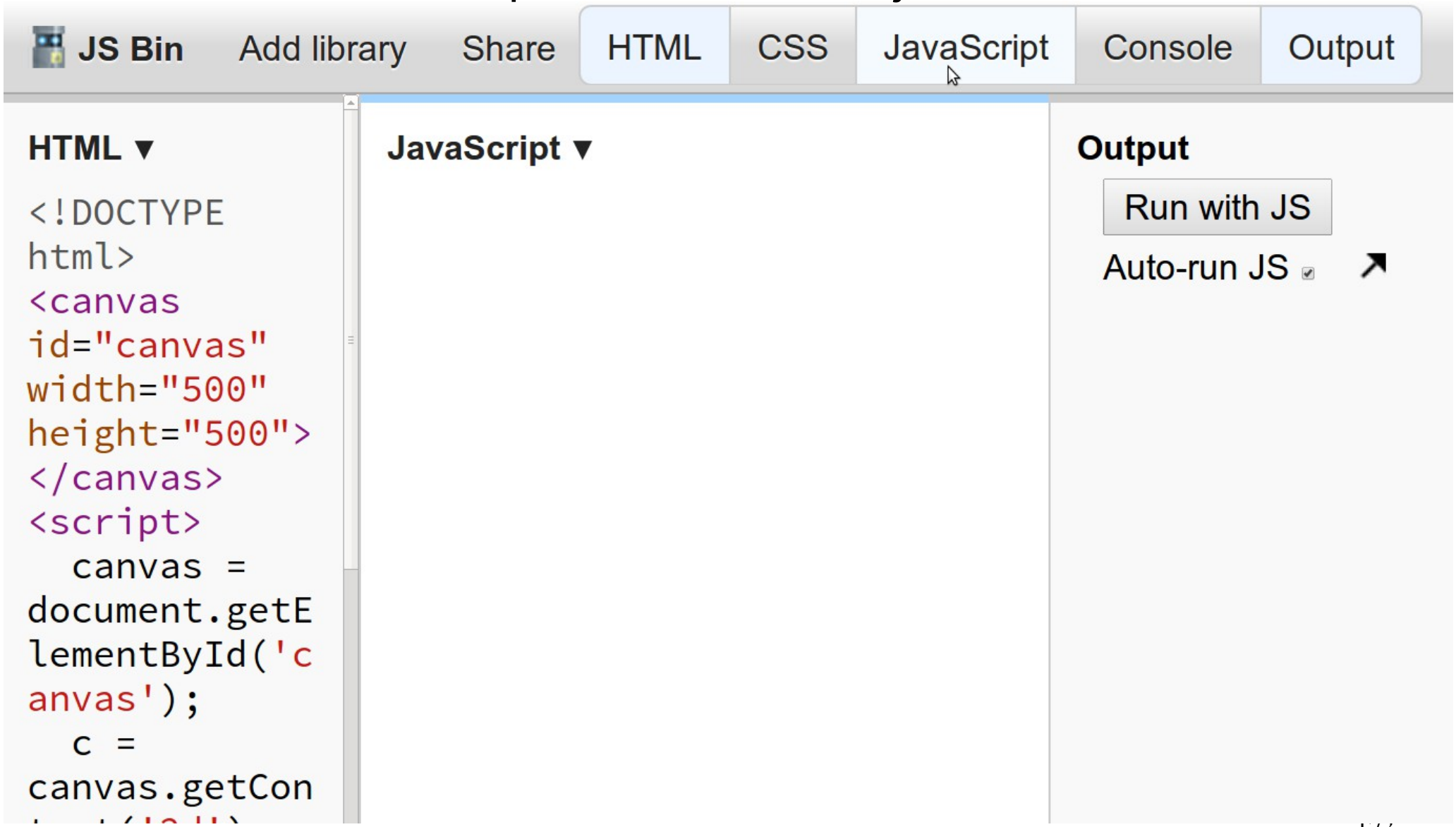
  - Advanced Animation



ADVANCED

jsbin

http://o.ooli.ca/canvasjsbin



jsbin

http://o.ooli.ca/canvasjsbin

Images

```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {



c.drawImage(a,100,50);



});
```

Images

```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {



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});
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Images

```
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});
```

Changing Images

```
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a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {



c.drawImage(a,100,50);



});
```

Changing Images

```
a = new Image();
a.src = 'http://e.ecli.ca/mona.jpg';

wait(function() {



c.drawImage(a,100,50);



});
```

Changing Images

```
a = new Image();  http://o.ooli.ca/ele.png
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {



c.drawImage(a,100,50);



});
```

Changing Images

```
a = new Image();
a.src = 'http://o.ooli.ca/ele.png';

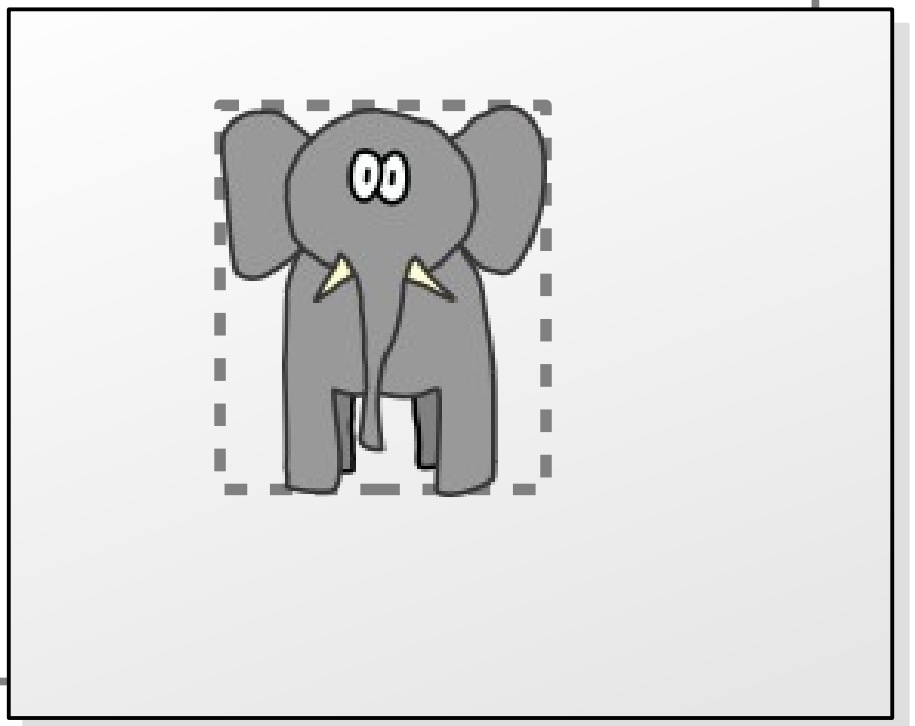
wait(function() {



c.drawImage(a,100,50);



});
```



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  - Properties...Address
- Paste it

- Or upload your own images!

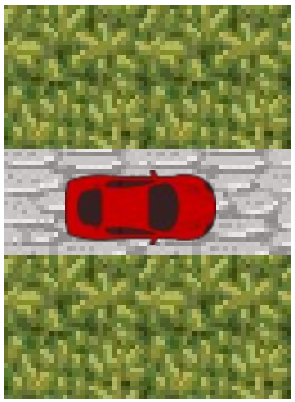
```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {

c.drawImage(a,100,50);

});
```

Ideas



- Find an image
- Right-click (ctrl-click)
- Copy
  - Copy Image URL
  - Copy Image Location
  - Copy Image Address
  - Properties...Address
- Paste it

```
http://o.ooli.ca/ele.png
http://o.ooli.ca/dog.png
http://o.ooli.ca/person.png
http://o.ooli.ca/car_top.png
http://o.ooli.ca/mona.jpg
http://o.ooli.ca/tree.png
http://o.ooli.ca/leaves.png
http://o.ooli.ca/stone.png
http://o.ooli.ca/brick.png
http://o.ooli.ca/grass.png
```


F12


ctrl - shift⇧ J

cmd⌘ - option⌥alt - C

Affine Transformations

- What are they?
  - Graphics effects for distorting images
  - Mostly useful for 3d animation
    - Due to useful mathematical properties

Affine Transformation Example

```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {



c.drawImage(a,10,10);



});
```

Affine Transformation Example

```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

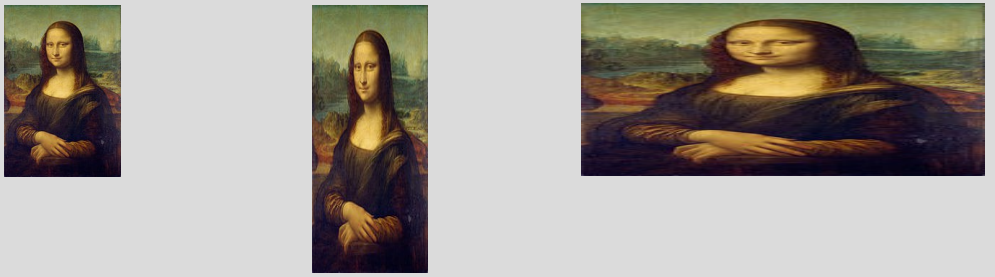
wait(function() {


c.scale(3, 1);
c.drawImage(a,10,10);

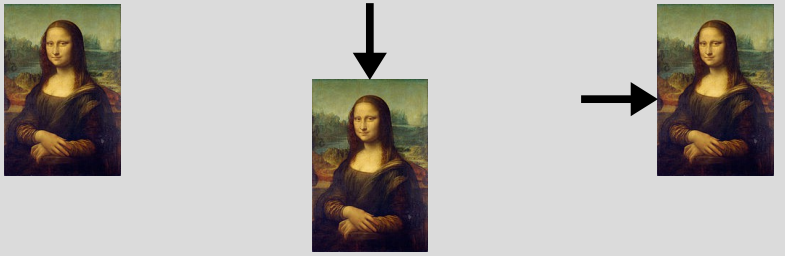

});
```

Four Distortions

scale



translate



rotate

shear *(not available in canvas)*

Scale

```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {


c.scale(1, 1);
c.drawImage(a,10,10);



});
```

Scale

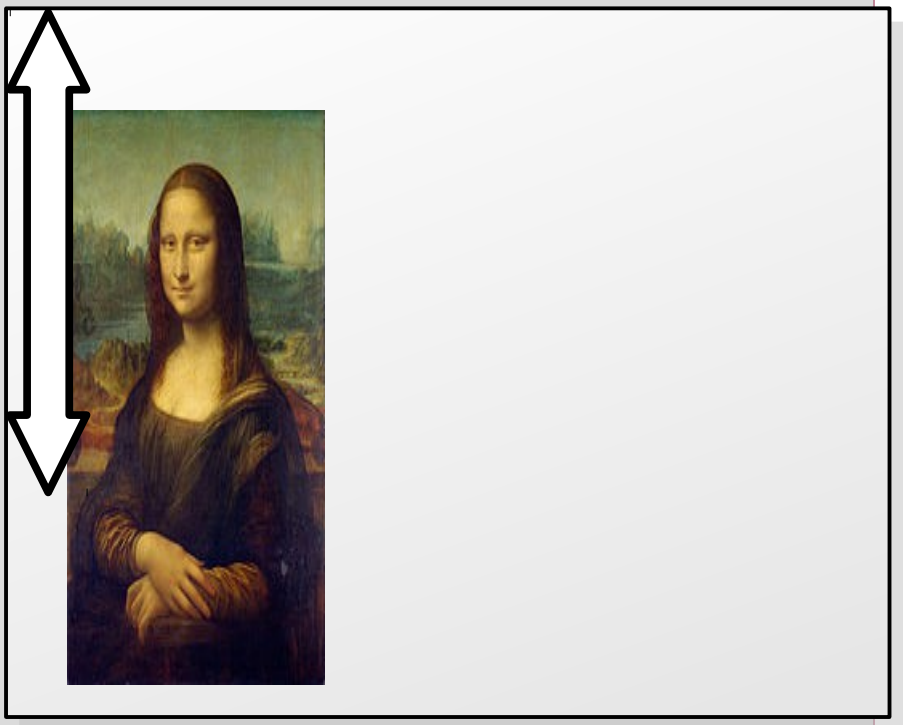
```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {


c.scale(1, 2);
c.drawImage(a,10,10);



});
```



Scale

```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {


c.scale(2, 1);
c.drawImage(a,10,10);



});
```

Scale

```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {


c.scale(3, 1);
c.drawImage(a,10,10);



});
```

Scale

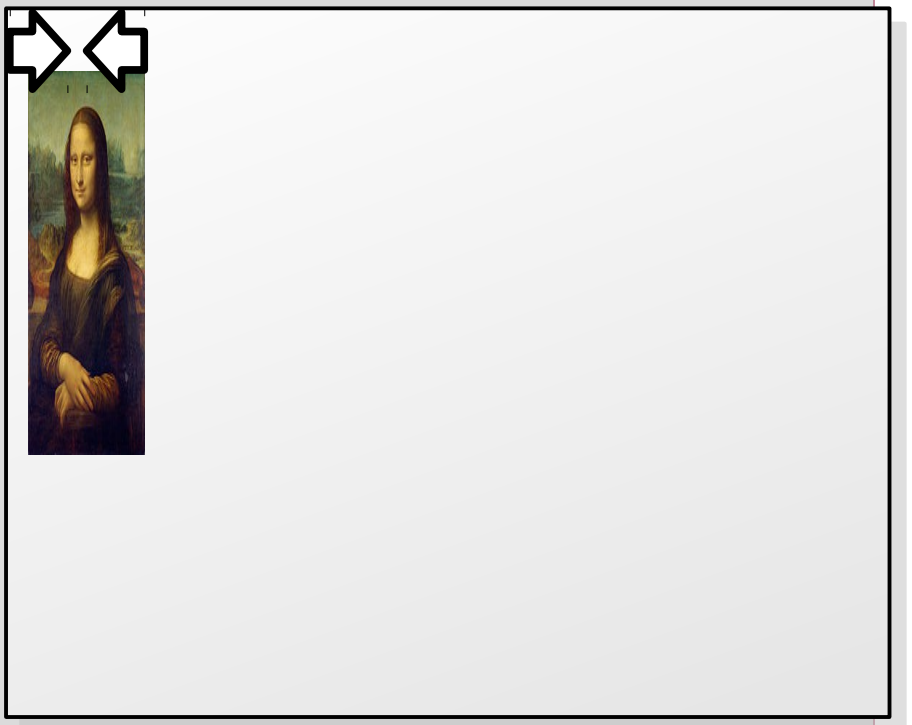
```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {


c.scale(0.5, 1);
c.drawImage(a,10,10);



});
```



Scale

```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {


c.scale(0.1, 1);
c.drawImage(a,10,10);



});
```

Scale

```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {


c.scale(-1, 1);
c.drawImage(a,10,10);


});
```

Scale

```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {


c.scale(-1, 1);
c.drawImage(a,100,10);



});
```

Translate

```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {


c.translate(0, 0);
c.drawImage(a,10,10);



});
```

Translate

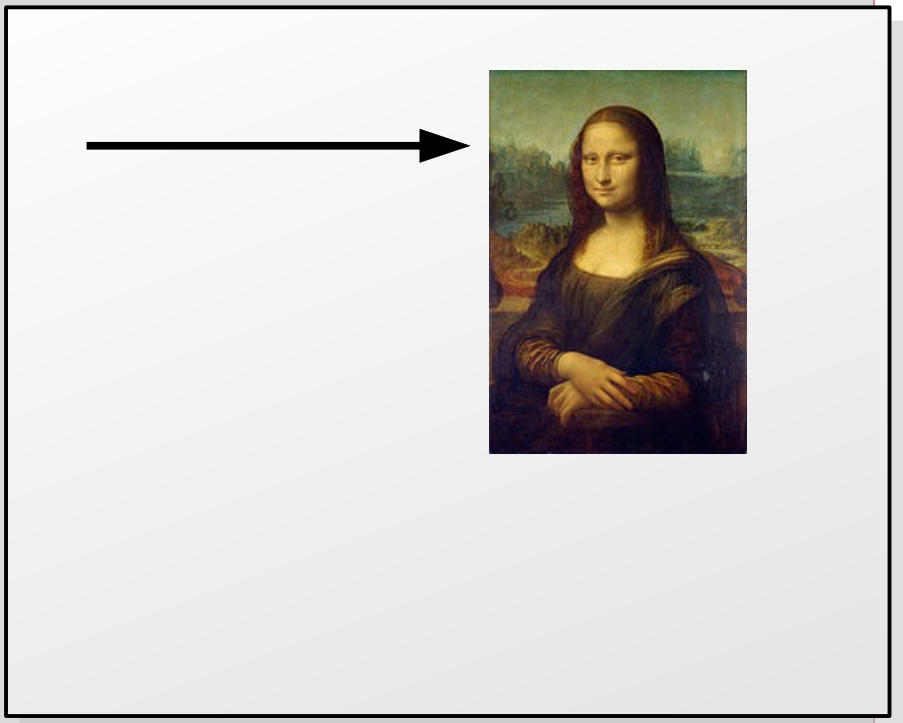
```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {


c.translate(300, 0);
c.drawImage(a,10,10);



});
```



Translate

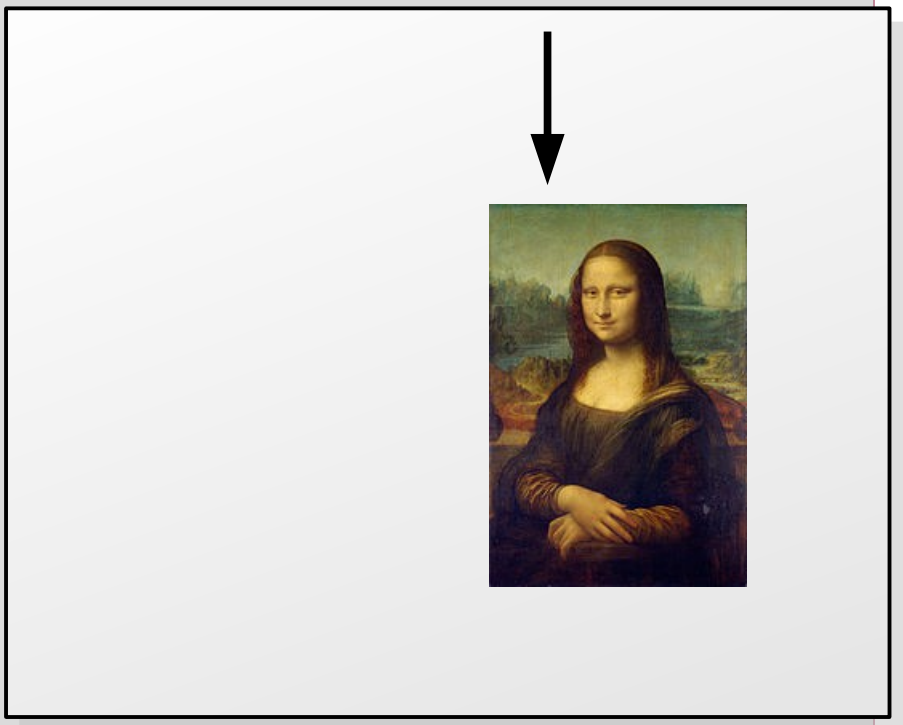
```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {


c.translate(300, 50);
c.drawImage(a,10,10);



});
```



Rotate

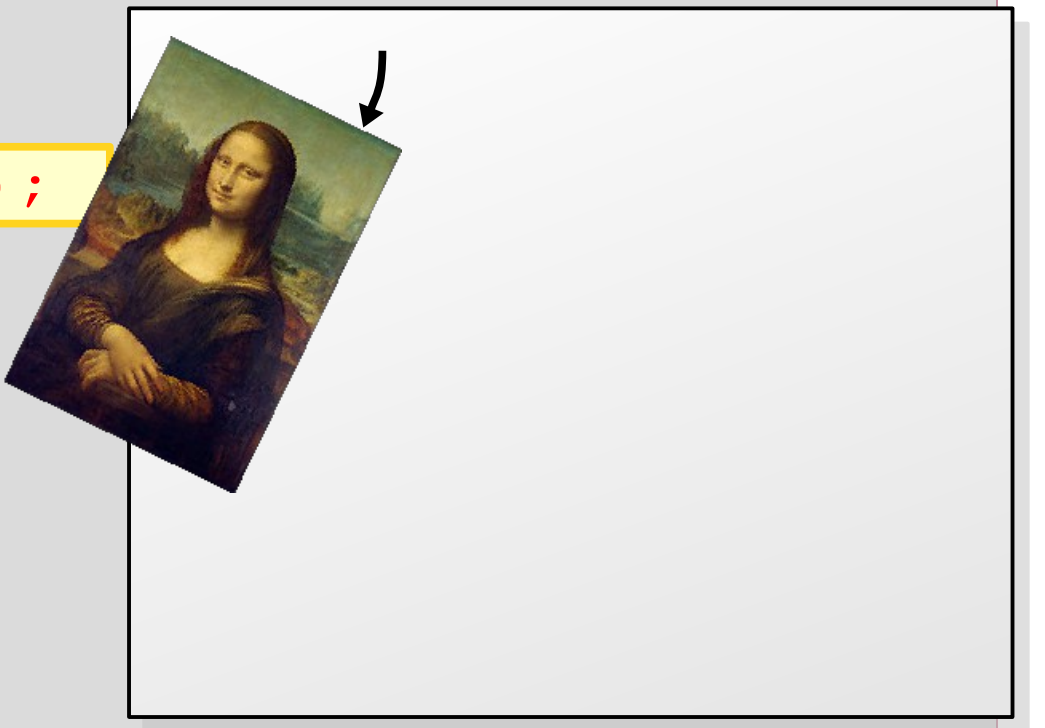
```
a = new Image();
a.src = 'http://o.ooli.ca/mona.jpg';

wait(function() {


c.rotate(30 * Math.PI / 180);
c.drawImage(a,10,10);



});
```



Combining Affine Transforms

```
c.translate(100, 0);
c.scale(1, 2);
c.rotate(20 * Math.PI / 180);
c.translate(-5, 0);
c.drawImage(a,10,10);
```

- More than one transformation?
  - What happens?

Combining Affine Transforms

```
c.translate(100, 0);
c.scale(1, 2);
c.rotate(20 * Math.PI / 180);
c.translate(-5, 0);
c.drawImage(a,10,10);
```

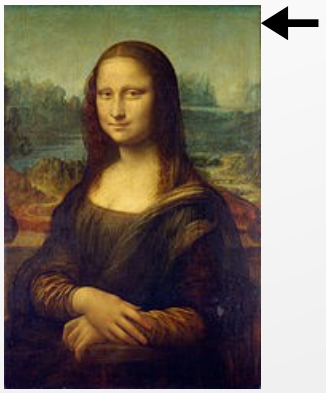
- Do the steps backwards!

Combining Affine Transforms

```
c.translate(100, 0);
c.scale(1, 2);
c.rotate(20 * Math.PI / 180);
c.translate(-5, 0);
c.drawImage(a,10,10);
```

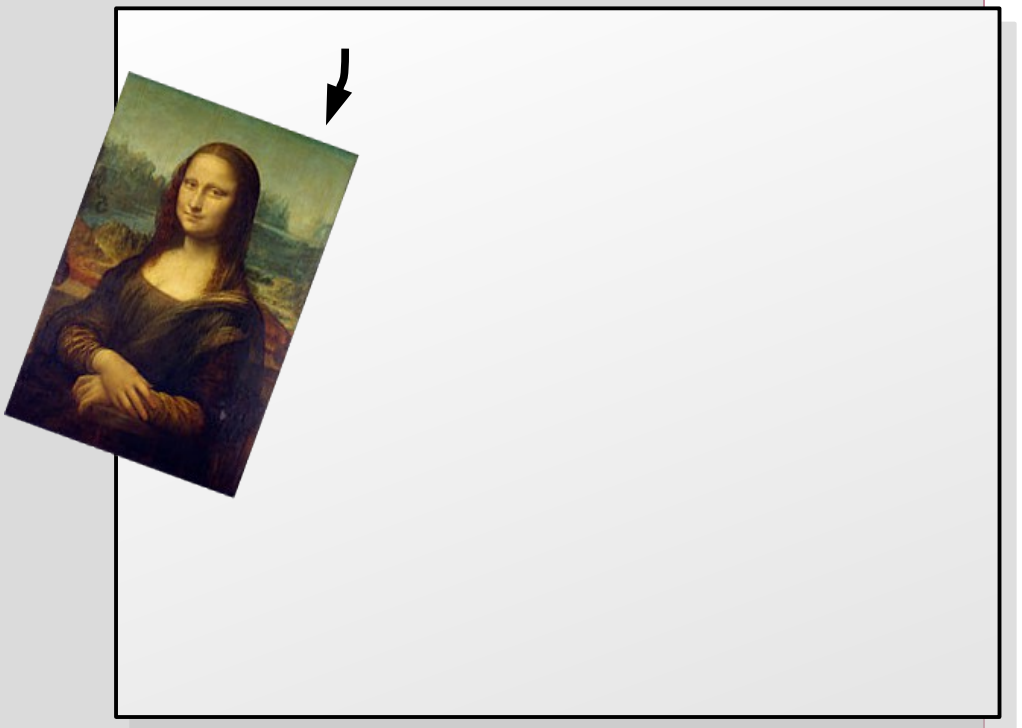
Combining Affine Transforms

```
c.translate(100, 0);
c.scale(1, 2);
c.rotate(20 * Math.PI / 180);
c.translate(-5, 0);
c.drawImage(a,10,10);
```



Combining Affine Transforms

```
c.translate(100, 0);
c.scale(1, 2);
c.rotate(20 * Math.PI / 180);
c.translate(-5, 0);
c.drawImage(a,10,10);
```

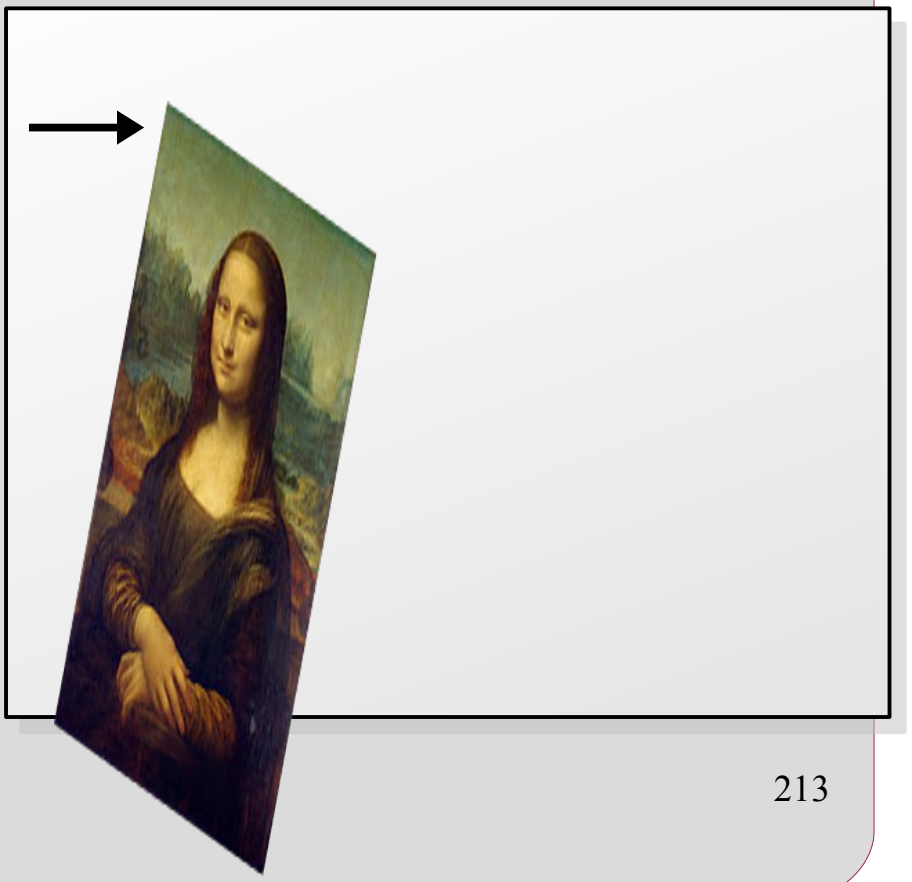


Combining Affine Transforms

```
c.translate(100, 0);
c.scale(1, 2);
c.rotate(20 * Math.PI / 180);
c.translate(-5, 0);
c.drawImage(a,10,10);
```

Combining Affine Transforms

```
c.translate(100, 0);
c.scale(1, 2);
c.rotate(20 * Math.PI / 180);
c.translate(-5, 0);
c.drawImage(a,10,10);
```



Overhead Car

```
a = new Image();
a.src = 'http://o.ooli.ca/car_top.png';

wait(function() {


c.drawImage(a, 0, 0);


});
```

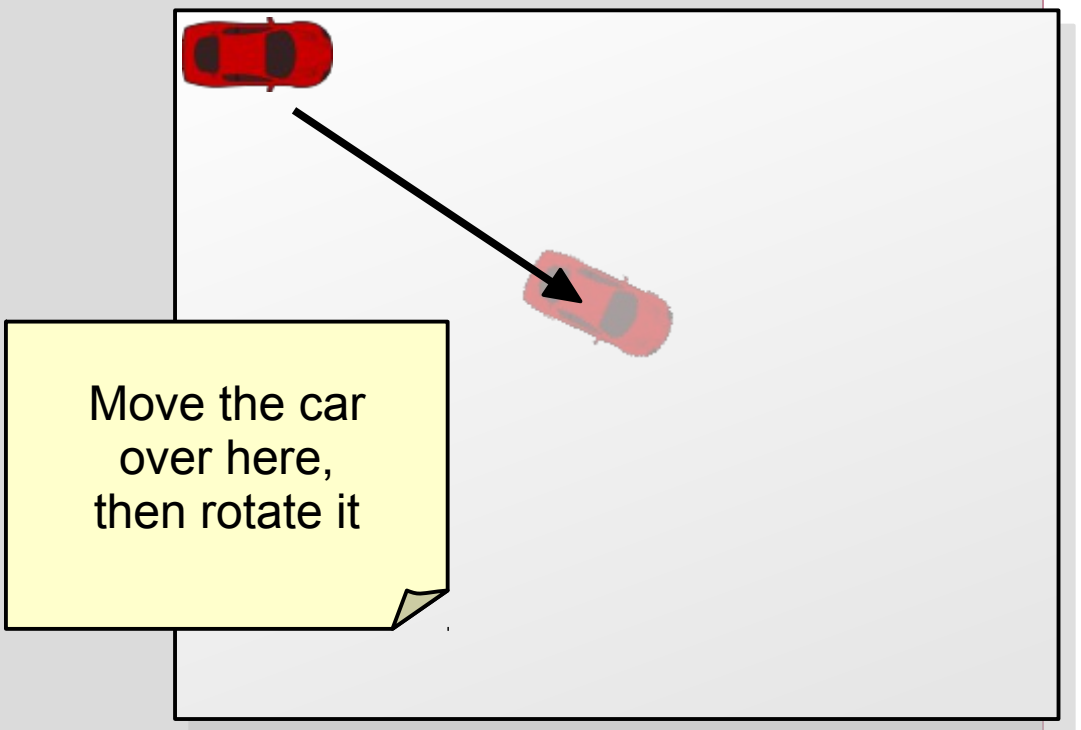
Overhead Car

```
a = new Image();
a.src = 'http://o.ooli.ca/car_top.png';

wait(function() {


c.drawImage(a, 0, 0);


});
```



Overhead Car

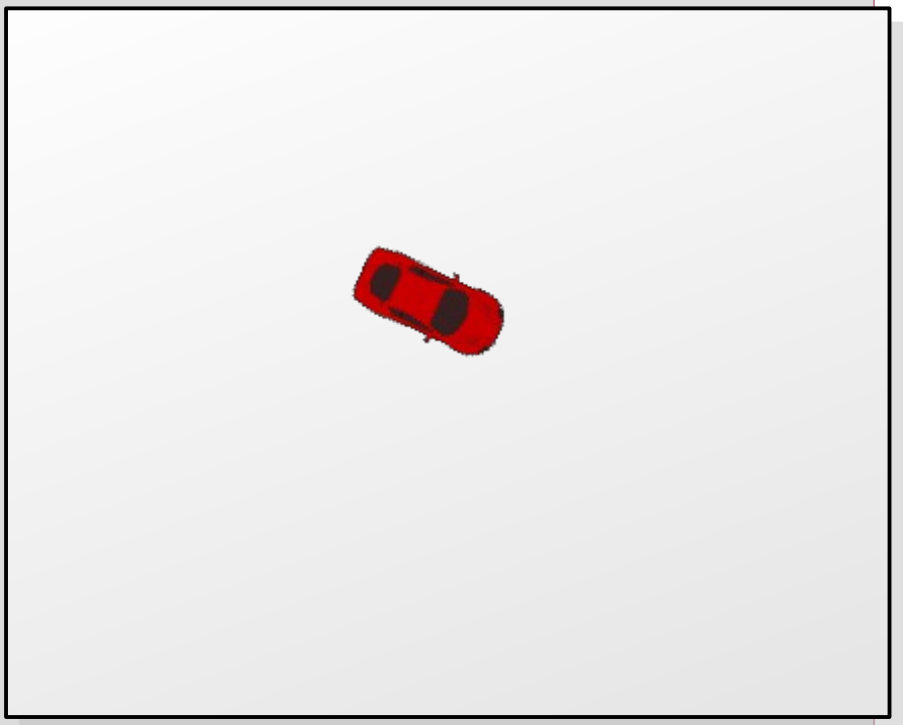
```
a = new Image();
a.src = 'http://o.ooli.ca/car_top.png';

wait(function() {

c.translate(200, 200);
c.rotate(30 * Math.PI / 180);
c.translate(-37, -19);
c.drawImage(a, 0, 0);

// Reset
c.setTransform(1,0,0,1,0,0);

});
```



Overhead Car

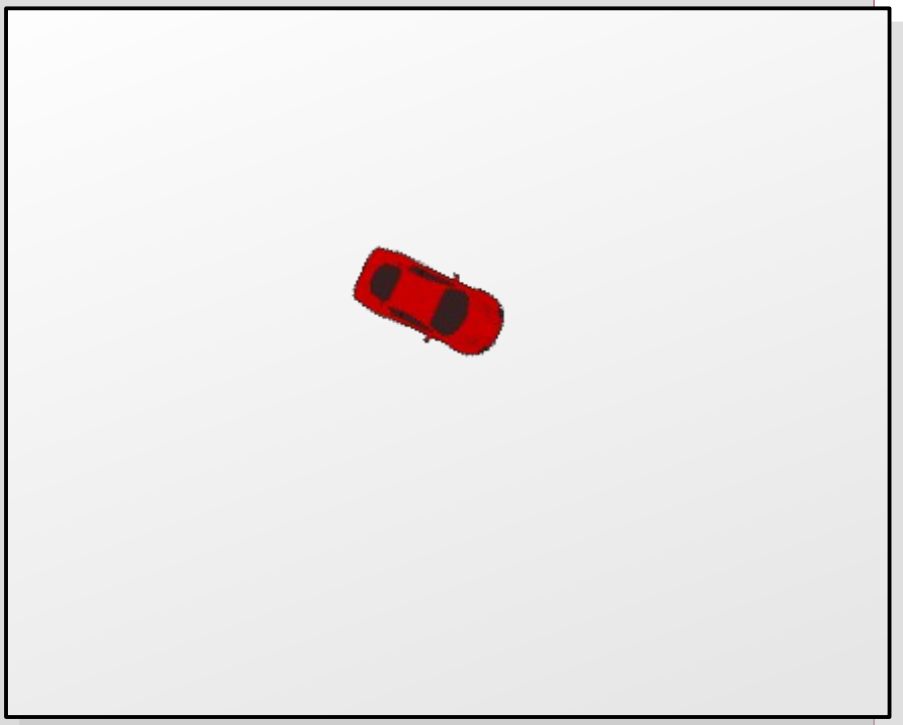
```
a = new Image();
a.src = 'http://o.ooli.ca/car_top.png';

wait(function() {

c.translate(200, 200);
c.rotate(30 * Math.PI / 180);
c.translate(-37, -19);
c.drawImage(a, 0, 0);

// Reset
c.setTransform(1,0,0,1,0,0);

});
```

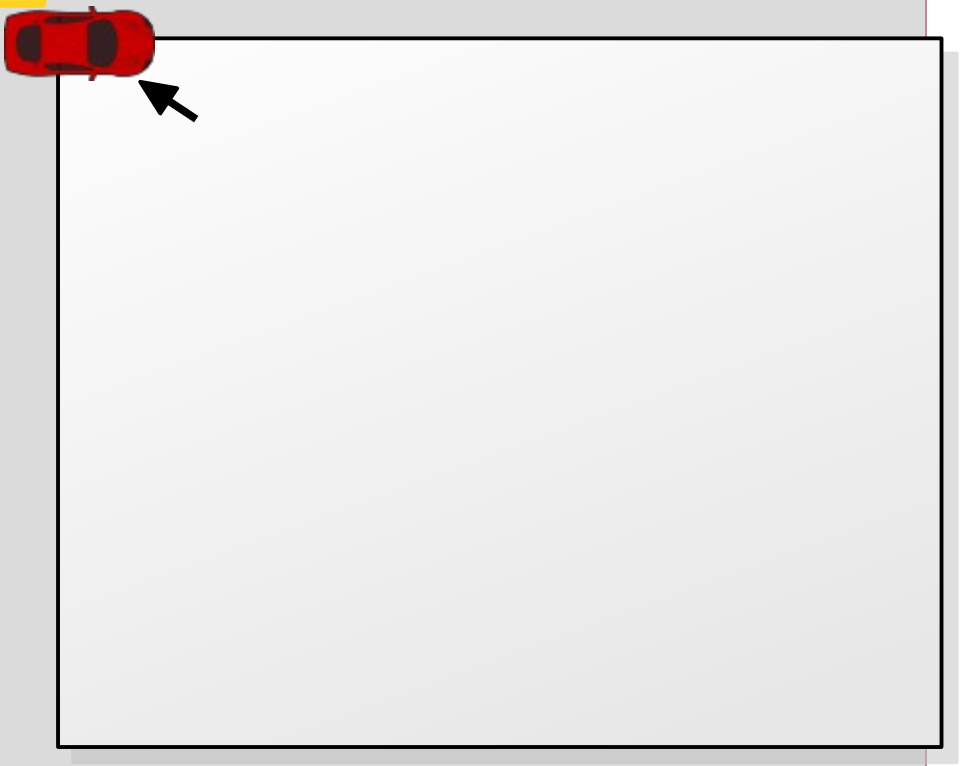


Overhead Car

```
c.translate(200, 200);
c.rotate(30 * Math.PI / 180);
c.translate(-37, -19);
c.drawImage(a, 0, 0);
```

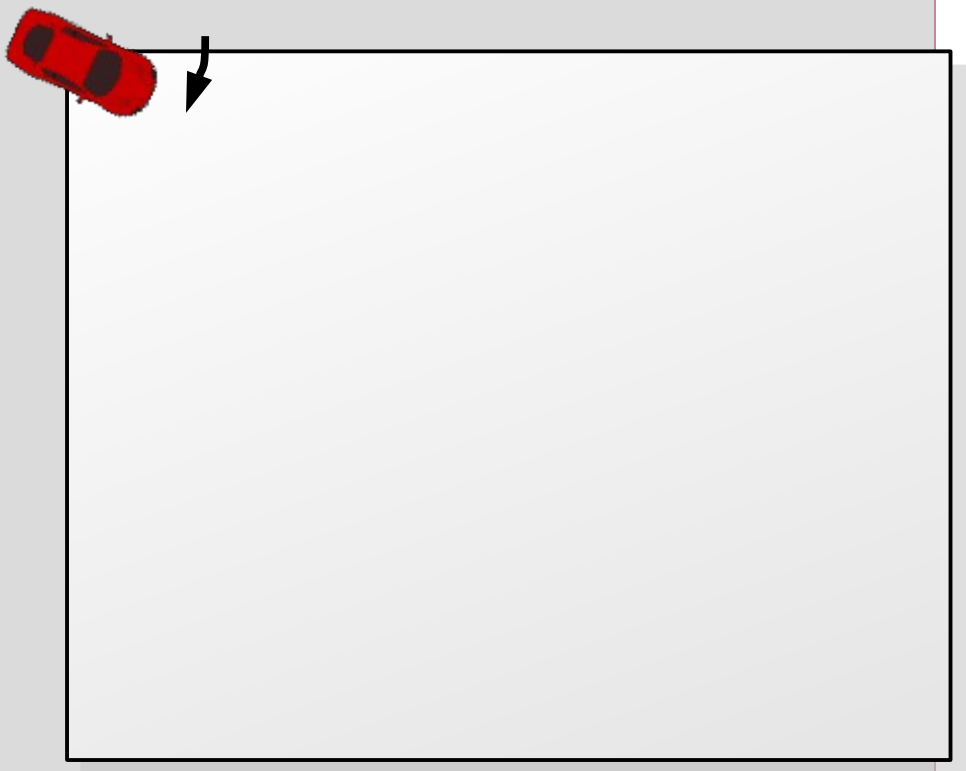
Overhead Car

```
c.translate(200, 200);
c.rotate(30 * Math.PI / 180);
c.translate(-37, -19);
c.drawImage(a, 0, 0);
```



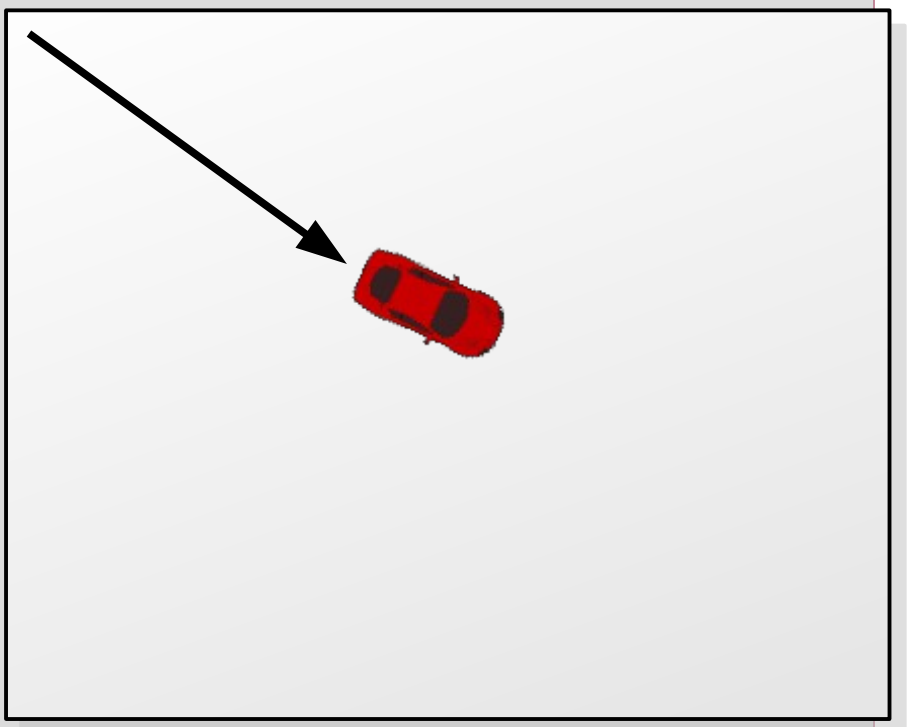
Overhead Car

```
c.translate(200, 200);
c.rotate(30 * Math.PI / 180);
c.translate(-37, -19);
c.drawImage(a, 0, 0);
```



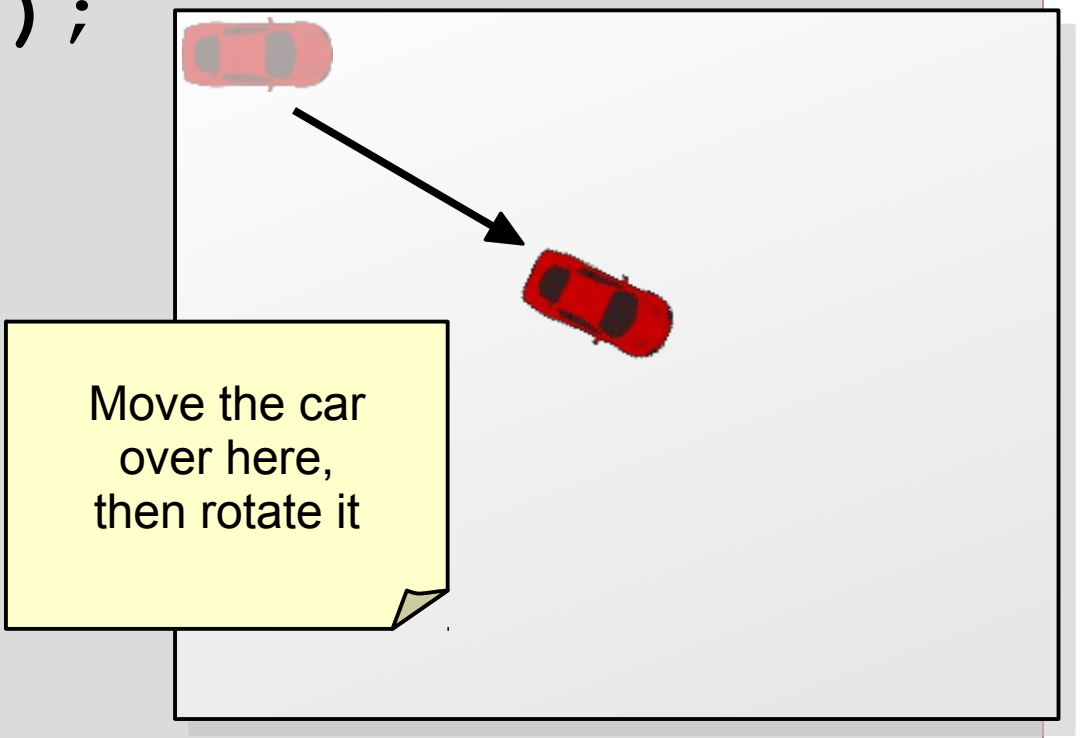
Overhead Car

```
c.translate(200, 200);
c.rotate(30 * Math.PI / 180);
c.translate(-37, -19);
c.drawImage(a, 0, 0);
```



Overhead Car

```
c.translate(200, 200);
c.rotate(30 * Math.PI / 180);
c.translate(-37, -19);
c.drawImage(a, 0, 0);
```



```
a = new Image();
a.src = 'http://o.ooli.ca/car_top.png';

wait(function() {

c.translate(200, 200);
c.rotate(30 * Math.PI / 180);
c.translate(-37, -19);
c.scale(1, 1);
c.drawImage(a, 0, 0);

// Reset
c.setTransform(1,0,0,1,0,0);

});
```

- Stretch an image
- Mirror or flip an image
- Rotate an image its lower-right point

- Find an image
- Right-click (ctrl-click)
- Copy
  - Copy Image URL
  - Copy Image Location
  - Copy Image Address
  - Properties...Address
- Paste it

```
http://o.ooli.ca/ …
  ele.png
  dog.png
  person.png
  car_top.png
  mona.jpg
  tree.png
  leaves.png
  stone.png
  brick.png
  grass.png
```


F12


ctrl - shift⇧ J

cmd⌘ - option⌥alt - C

Animation: Moving Things

Animation: Moving Things

Images Review

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';

wait(function() {



c.drawImage(a,50,50);



});
```

Images Review

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';

wait(function() {



c.drawImage(a,50,50);



});
```

Images Review

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';

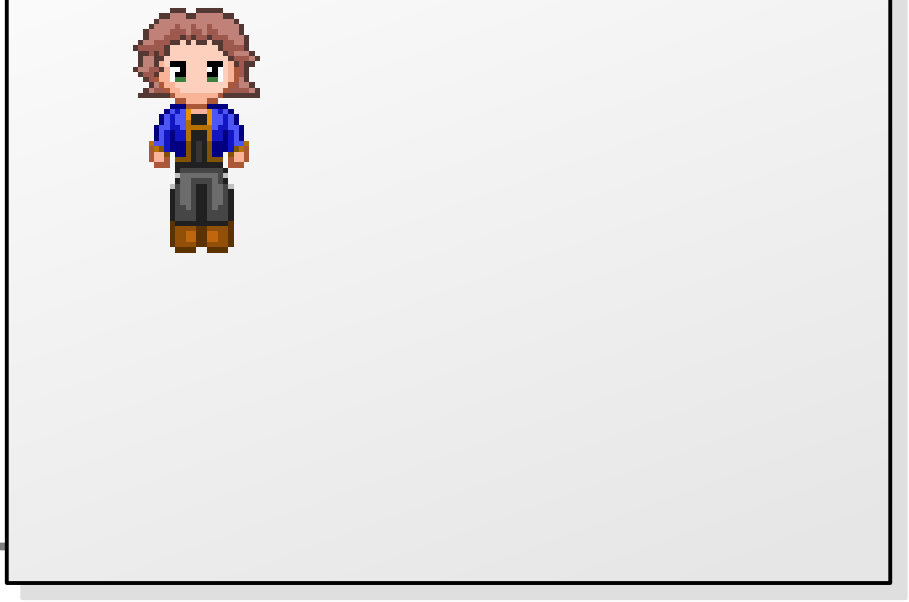
wait(function() {



c.drawImage(a,50,50);



});
```



Animation

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';

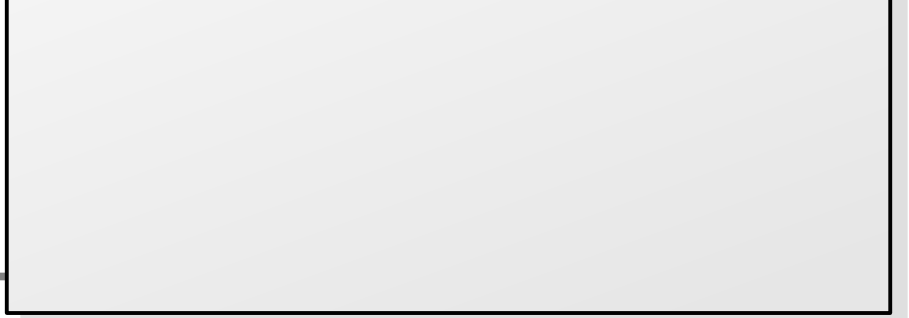
wait(function() {



c.drawImage(a,50,50);



});
```



Animation

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';

wait(function() {



c.drawImage(a,50,50);



});
```

Animation

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';

repeat(function() {



c.drawImage(a,50,50);



});
```

Animation

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';

repeat(function() {


c.drawImage(a,50,50);


});
```

Animation: Variables

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';

repeat(function() {



c.drawImage(a,50,50);



});
```

Animation: Variables

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';

repeat(function() {



c.drawImage(a,50,50);



});
```

Animation: Variables

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {



c.drawImage(a, x,50);



});
```

Animation: Changing Things

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {



c.drawImage(a, x,50);
x = x + 1;



});
```

Animation: Changing Things

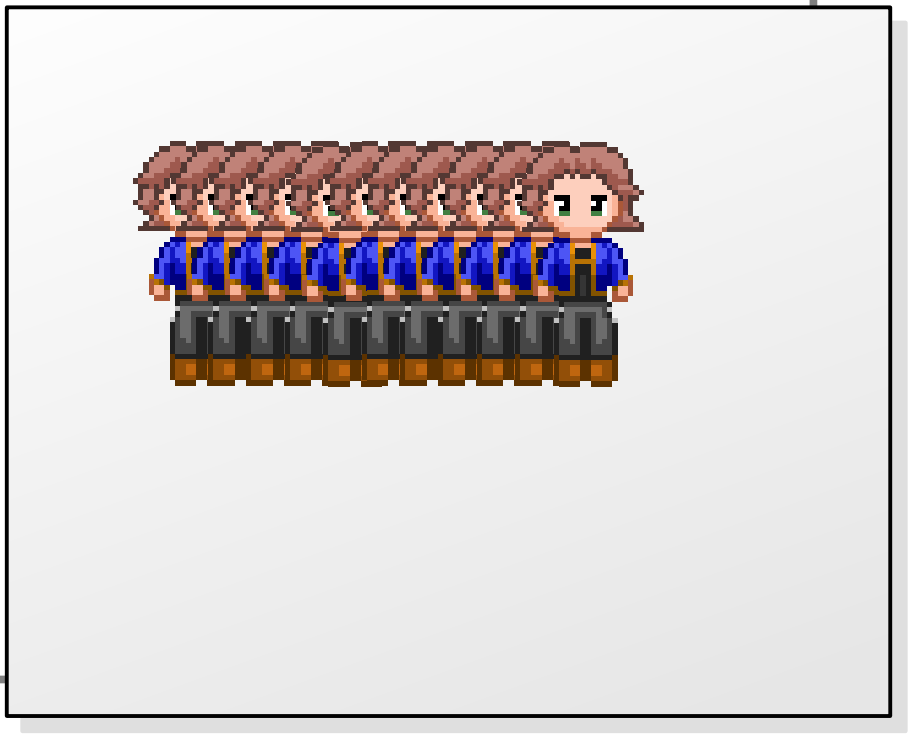
```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {



c.drawImage(a, x,50);
x = x + 1;



});
```



Animation: Changing Things

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + 1;


});
```

Animation: Changing Things

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + 1;


});
```

Animation: Changing Things

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + 1;


});
```

Animation: Changing Things

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + 1;


});
```

Animation: Changing Things

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


  c.clear();
  c.drawImage(a, x,50);
  x = x + 1;


});
```

Animation: Changing Things

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + 1;

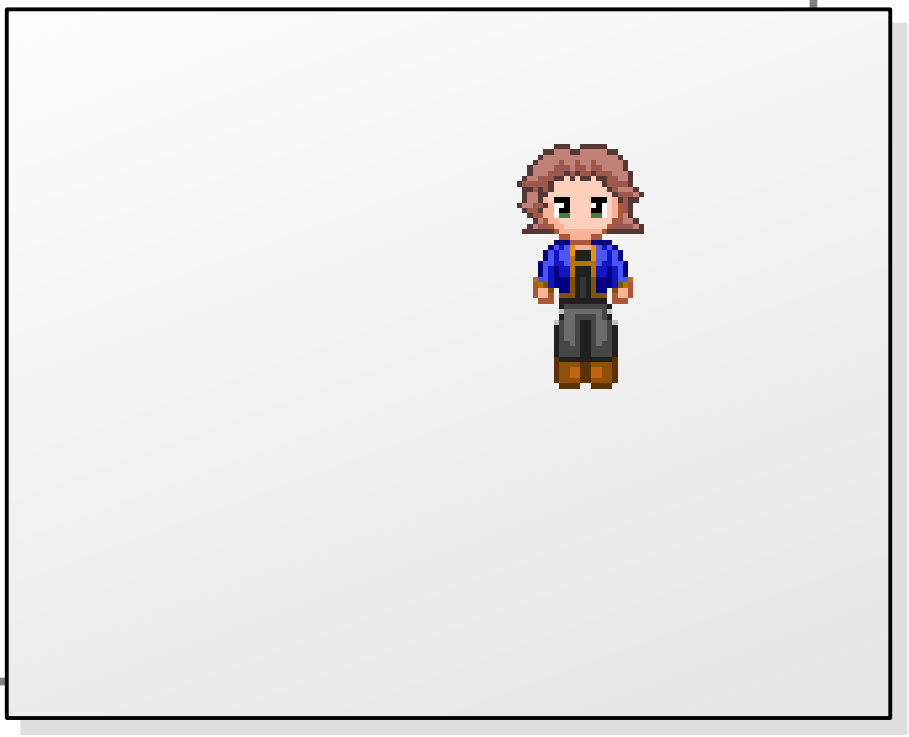

});
```

Animation: Changing Things

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


  c.clear();
  c.drawImage(a, x,50);
  x = x + 1;


});
```

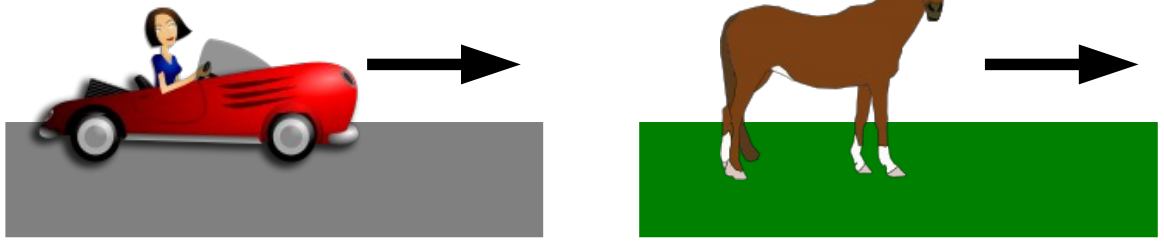


```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {

c.clear();
c.drawImage(a, x, 50);
x = x + 1;

});
```

Ideas



- Find an image
- Right-click (ctrl-click)
- Copy
  - Copy Image URL
  - Copy Image Location
  - Copy Image Address
  - Properties...Address
- Paste it

```
http://o.ooli.ca/ …
   ele.png
   dog.png
   person.png
   car_top.png
   mona.jpg
   tree.png
   leaves.png
   stone.png
   brick.png
   grass.png
```

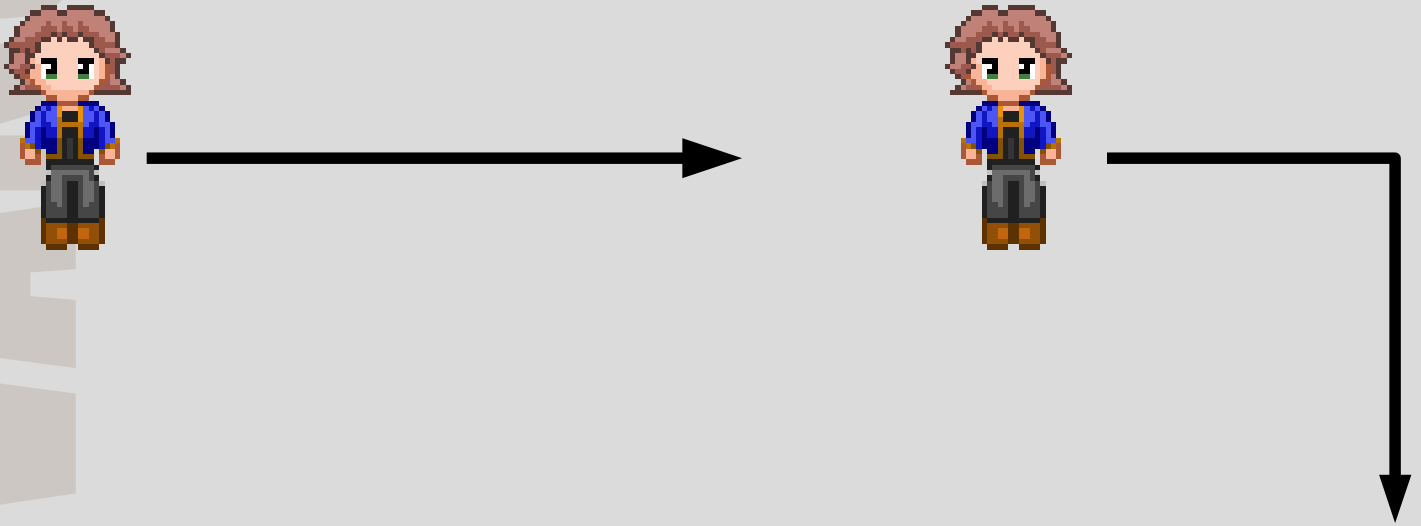

F12


ctrl - shift⇧ J

cmd⌘ - option⌥alt - C

Advanced Animation

- So far
- More flexibility



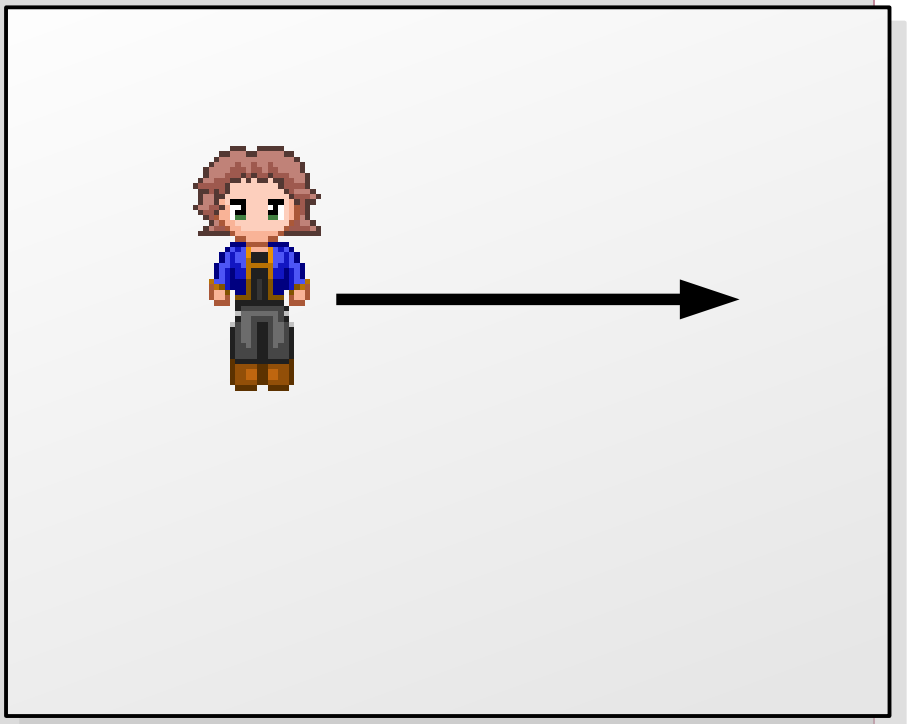
Time

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
y = 50;

repeat(function() {

c.clear();
c.drawImage(a, x, y);
x = x + 1;


});
```



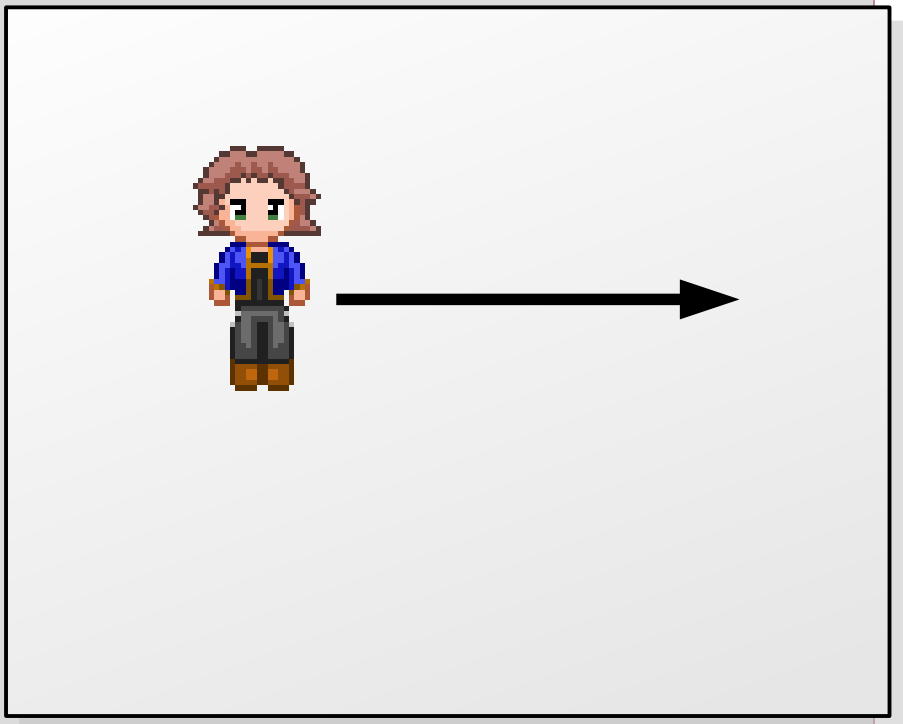
Time

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
y = 50;

repeat(function() {

c.clear();
c.drawImage(a, x, y);
x = x + 1;


});
```

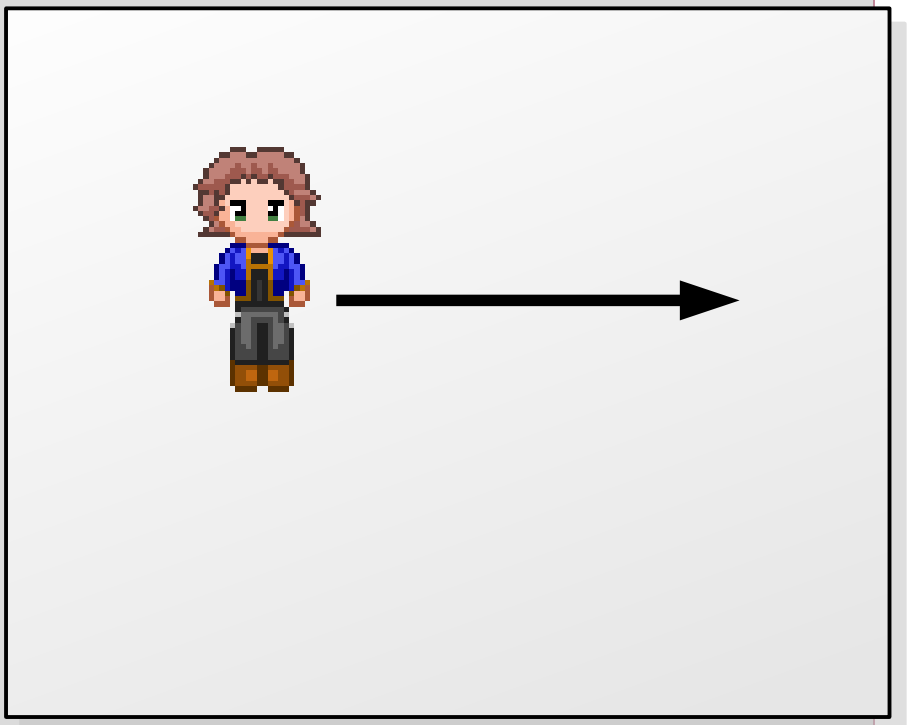


Time

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
y = 50;
time = 1;
repeat(function() {

c.clear();
c.drawImage(a, x, y);
x = x + 1;


});
```

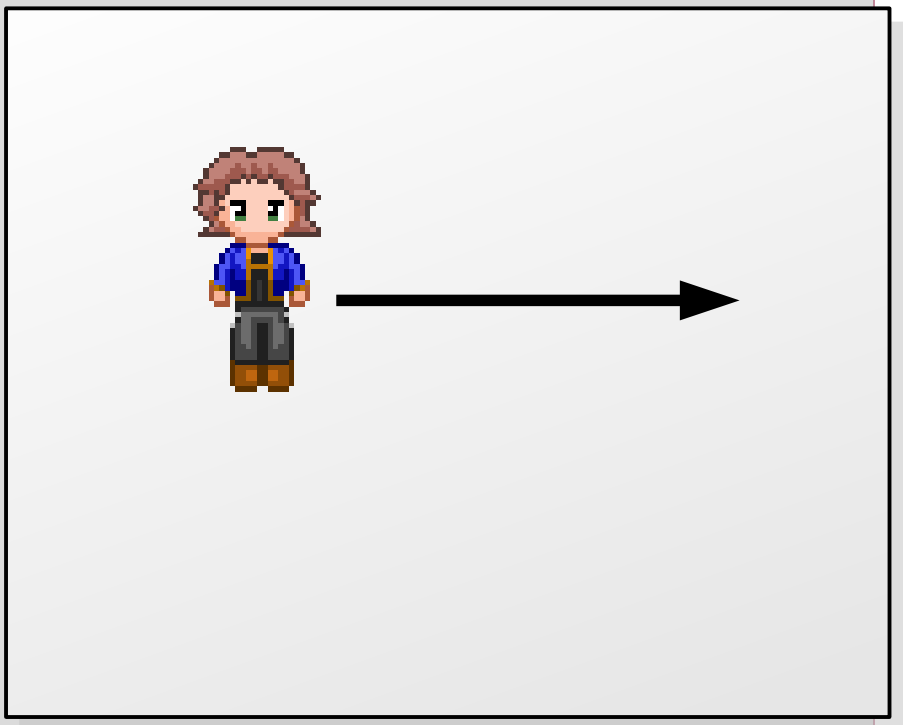


Time

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
y = 50;
time = 1;
repeat(function() {

  c.clear();
  c.drawImage(a, x, y);
  time = time + 1;
  x = x + 1;

});
```



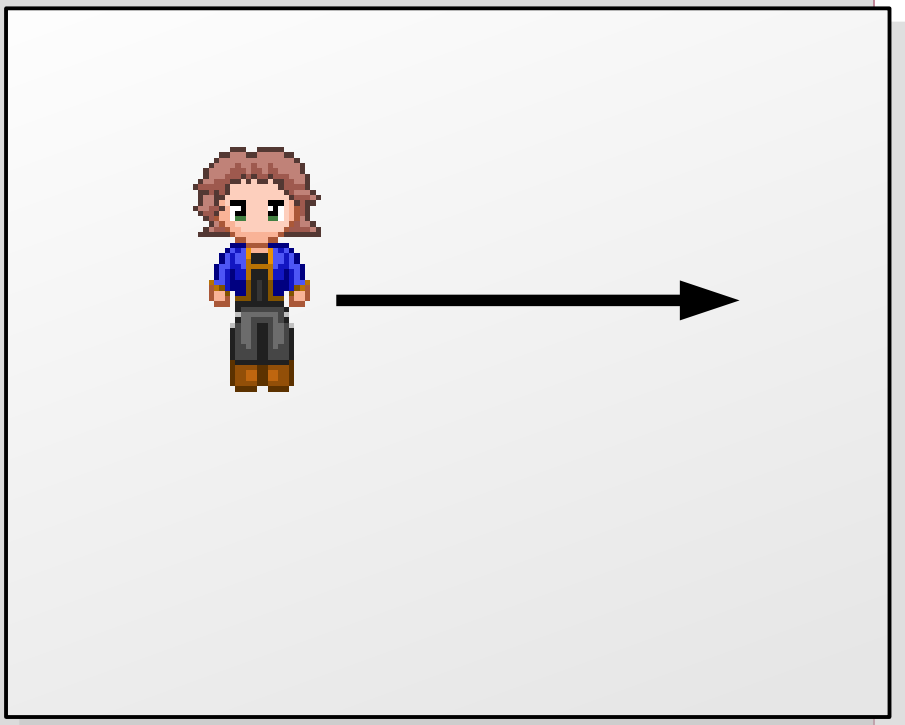
What Time Is It?

```
...
repeat(function() {

c.clear();
c.drawImage(a, x, y);
time = time + 1;
x = x + 1;


});
```

Move right

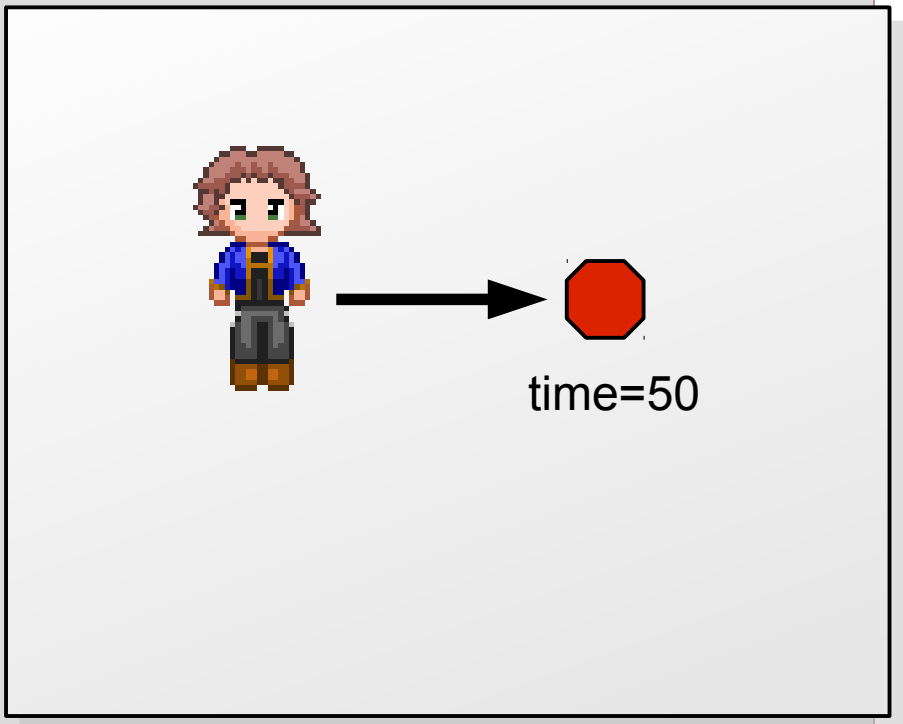


What Time Is It?

```
...
repeat(function() {

c.clear();
c.drawImage(a, x, y);
time = time + 1;
if (time > 1 && time < 50) {
  x = x + 1;
}


});
```



What Time Is It?

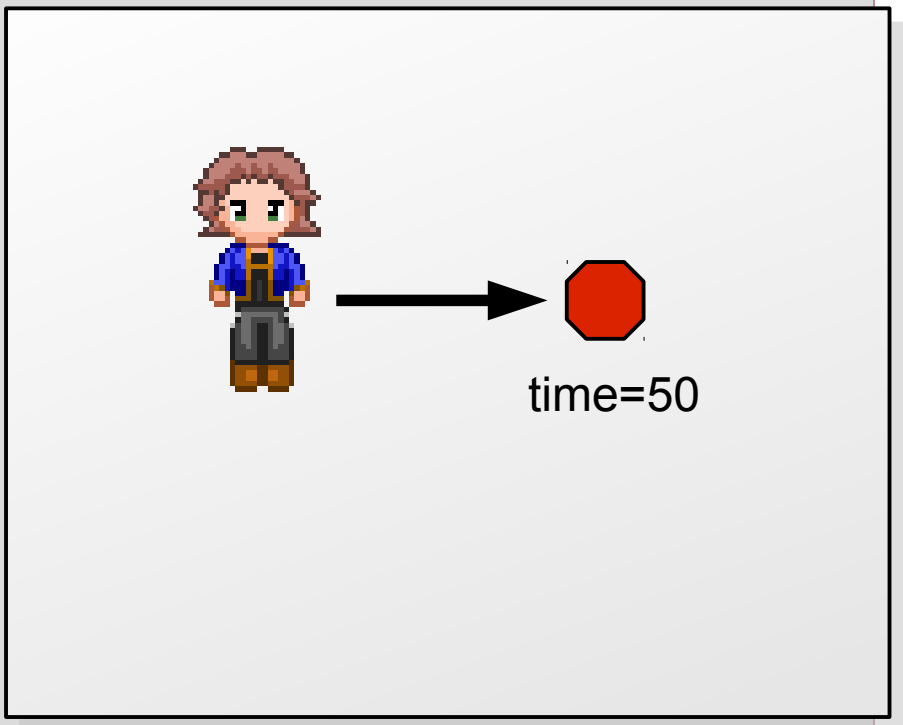
```
...
repeat(function() {

c.clear();
c.drawImage(a, x, y);
time = time + 1;
if (time > 1 && time < 50) {
  x = x + 1;
}

});
```

When time is between 1 and 50,

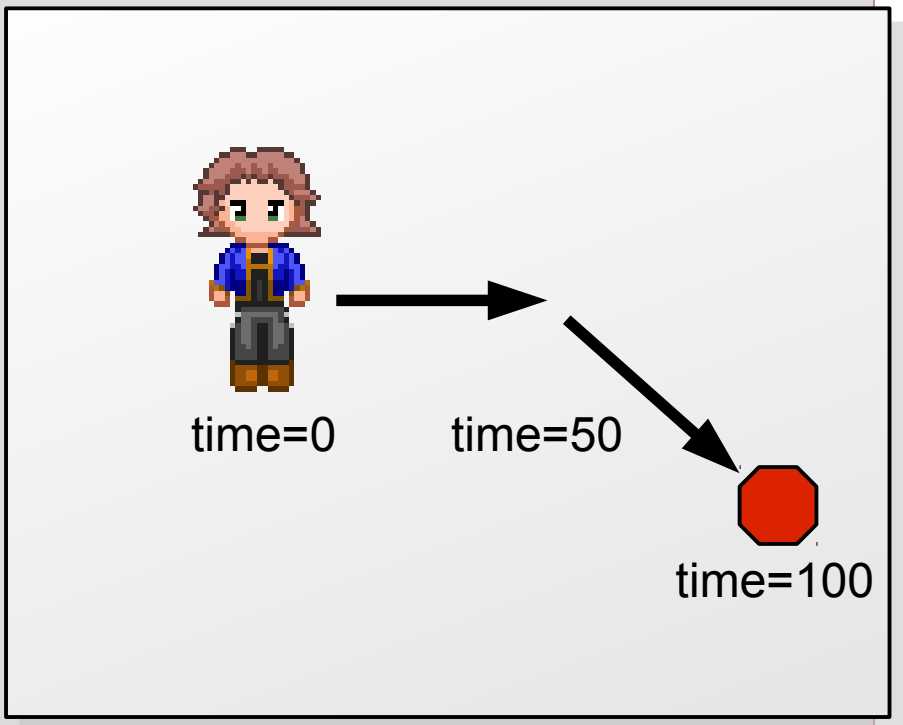
move right



What Time Is It?

```
...
repeat(function() {

c.clear();
c.drawImage(a, x, y);
time = time + 1;
if (time > 1 && time < 50) {
  x = x + 1;
}
if (time > 50 && time < 100) {
  x = x + 1;
  y = y + 1;
}
});
```



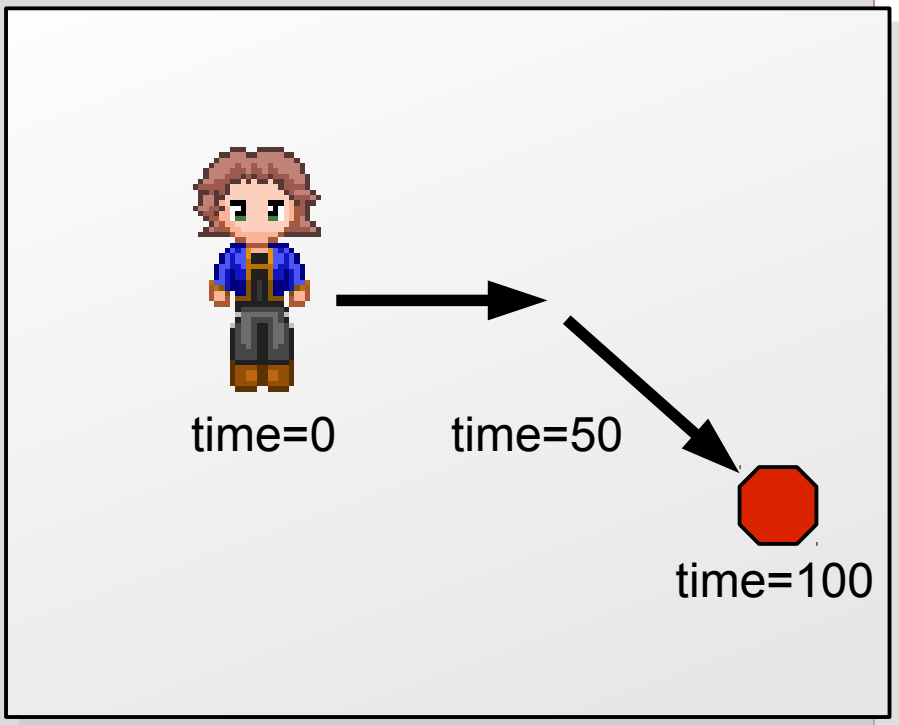
What Time Is It?

```
...
repeat(function() {

c.clear();
c.drawImage(a, x, y);
time = time + 1;
if (time > 1 && time < 50) {
  x = x + 1;
}
if (time > 50 && time < 100) {
  x = x + 1;
  y = y + 1;
}
});
```

When time is between 50 and 100,

move right and down



```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
y = 50;
time = 1;
repeat(function() {

c.clear();
c.drawImage(a, x, y);
time = time + 1;
if (time > 1 && time < 50) {
  x = x + 1;
}
if (time > 50 && time < 100) {
  x = x + 1;
  y = y + 1;
}
});
```

- Find an image
- Right-click (ctrl-click)
- Copy
  - Copy Image URL
  - Copy Image Location
  - Copy Image Address
  - Properties...Address
- Paste it

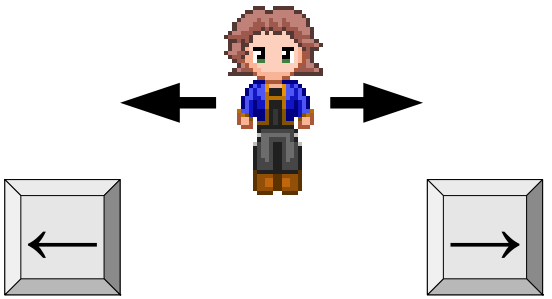
```
http://o.ooli.ca/ …
  ele.png
  dog.png
  person.png
  car_top.png
  mona.jpg
  tree.png
  leaves.png
  stone.png
  brick.png
  grass.png
```


F12


ctrl - shift⇧ J

cmd⌘ - option⌥alt - C

Using the Keyboard



Animation Review

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {



c.clear();
c.drawImage(a, x,50);
x = x + 1;



});
```

Animation Review

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + 1;


});
```

Animation Review

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + 1;


});
```

Animation Review

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + 1;


});
```

Animation Review

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + 1;


});
```

Animation Review

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + 1;


});
```

Animation Review

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + 1;


});
```

Animation Review

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + 1;

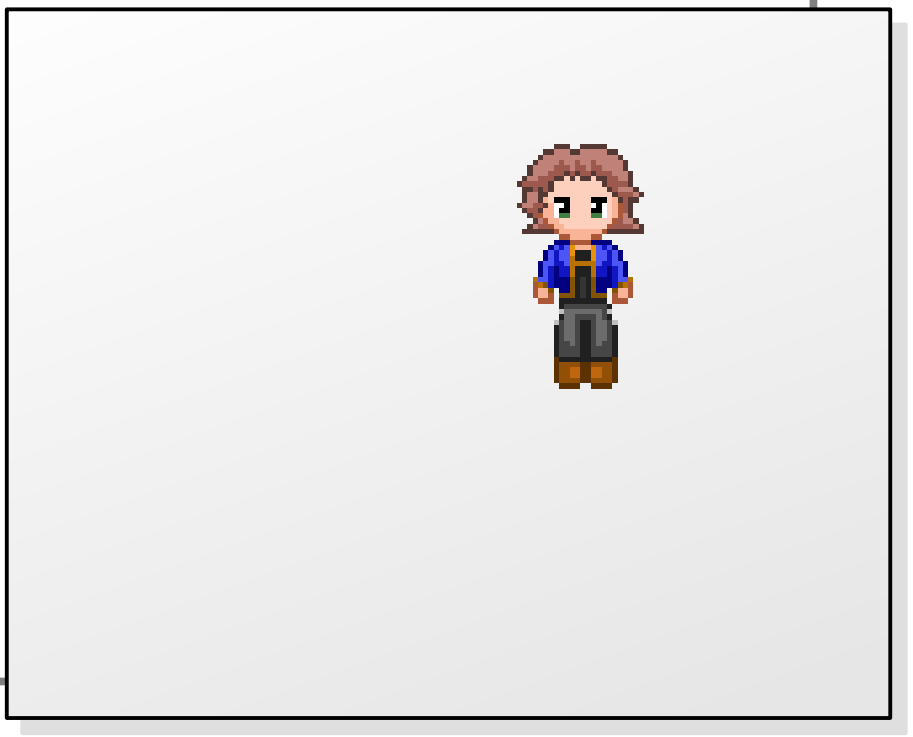

});
```

Animation Review

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + 1;


});
```



Keyboard: dx

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + 1;


});
```

Keyboard: dx

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + 1;


});
```

Keyboard: dx

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + dx;

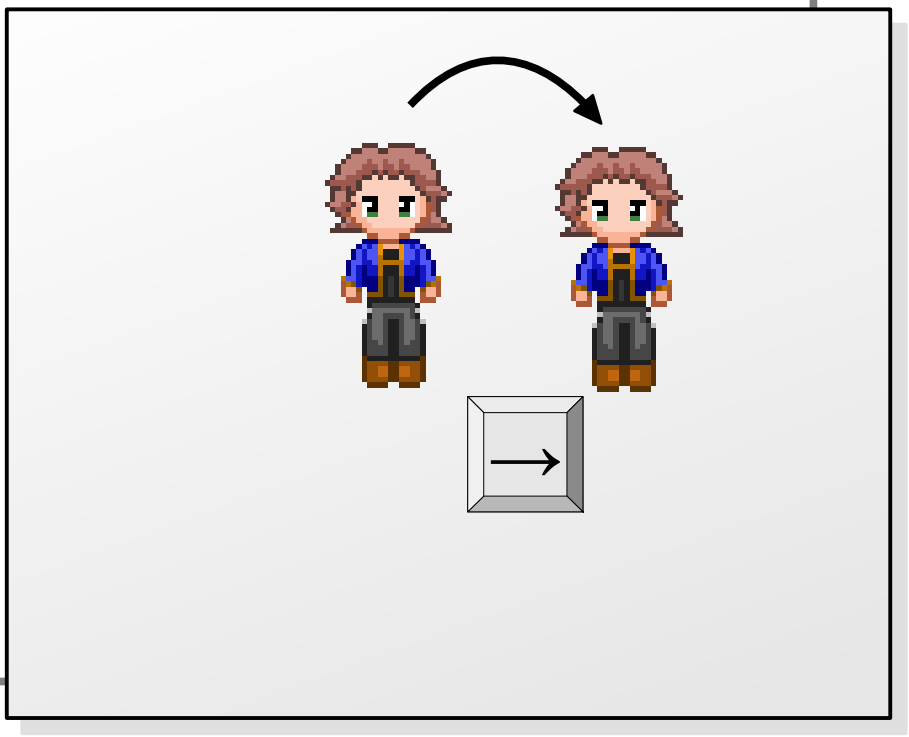

});
```

Keyboard: dx

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + dx;


});
```



Keyboard: dx

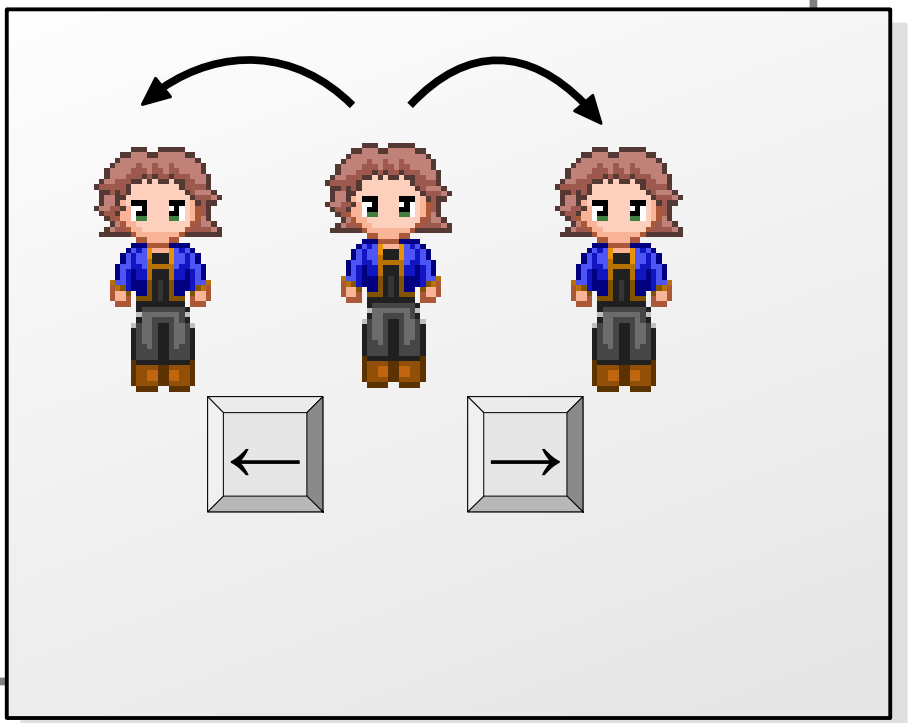
```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {



c.clear();
c.drawImage(a, x,50);
x = x + dx;



});
```



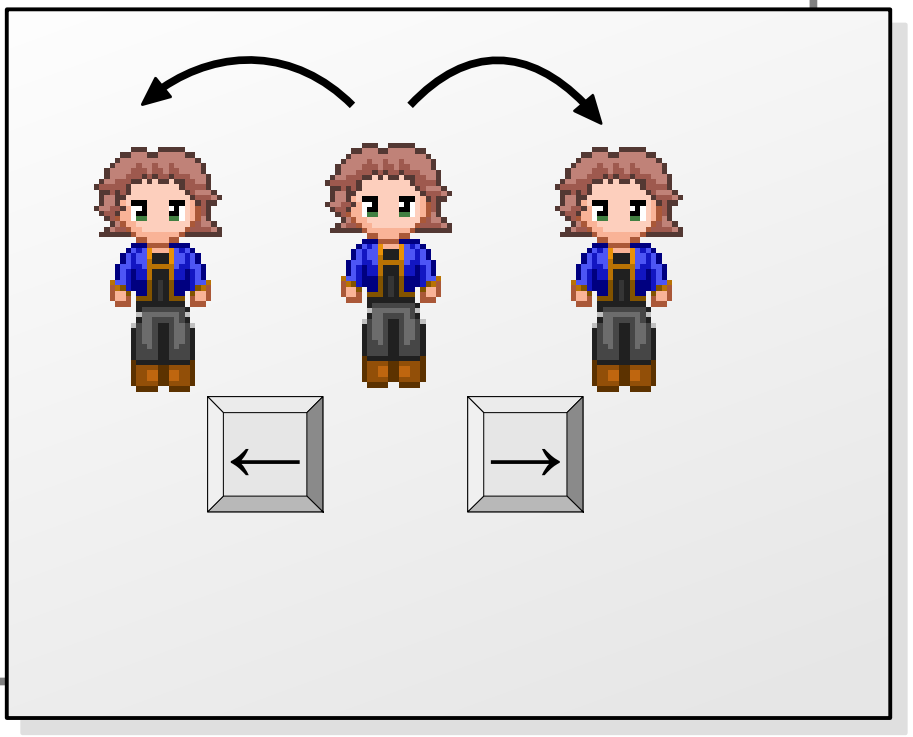
Keyboard: dx

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + dx;

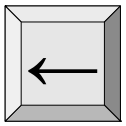

});
```

Done!

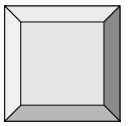


Keyboard: dx

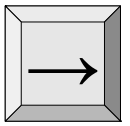
- Special variable *dx*



dx = -1



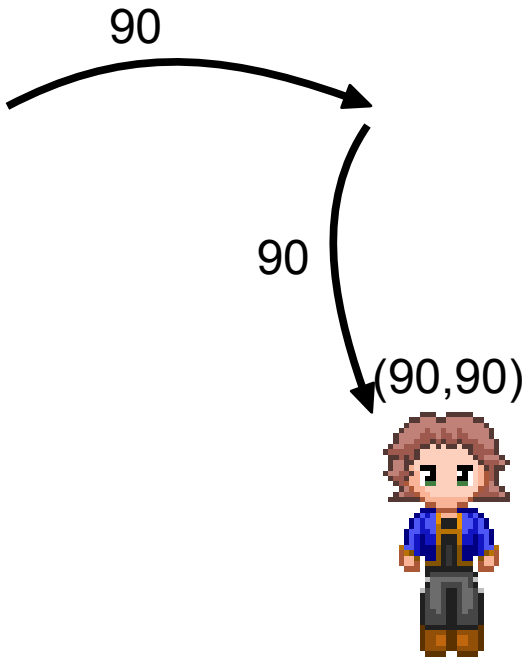
dx = 0



dx = +1

Keyboard: Why Does This Work?

- Remember, use (x, y) for positions



Keyboard: Change in Positions

- To go right, **x** should get **bigger**

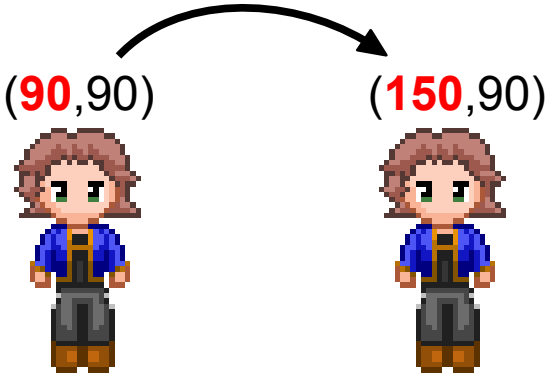
- To go left, **x** should get **smaller**

(**90**,90)

Keyboard: Change in Positions

- To go right, **x** should get **bigger**

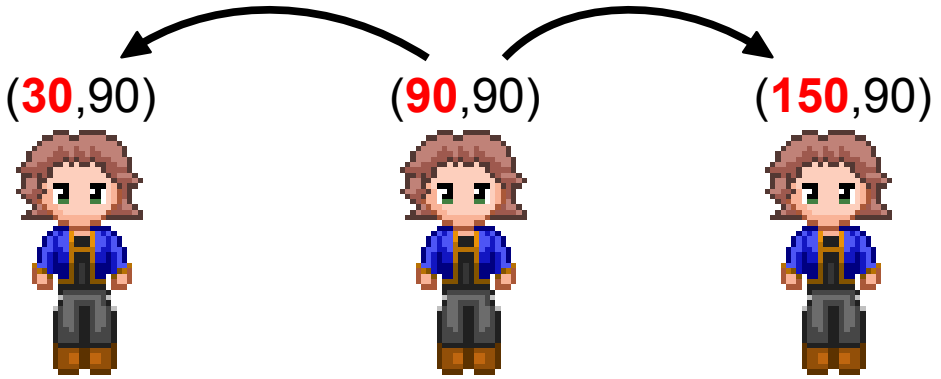
- To go left, **x** should get **smaller**



Keyboard: Change in Positions

- To go right, **x** should get **bigger**

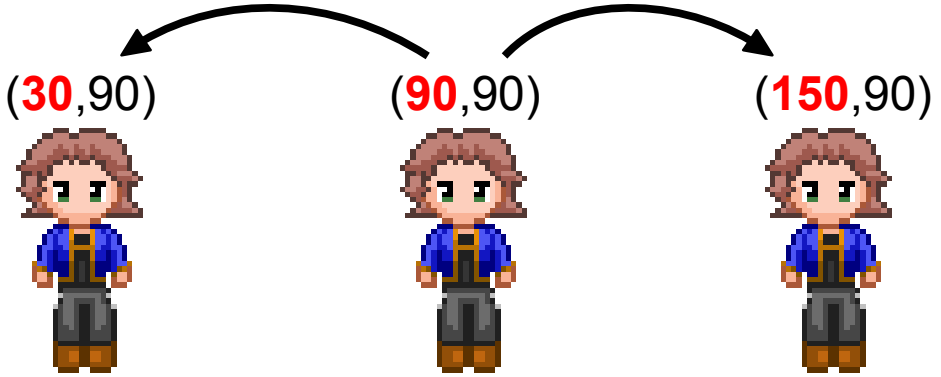
- To go left, **x** should get **smaller**



Change in x

- To go right, **x** should get **bigger**

- To go left, **x** should get **smaller**

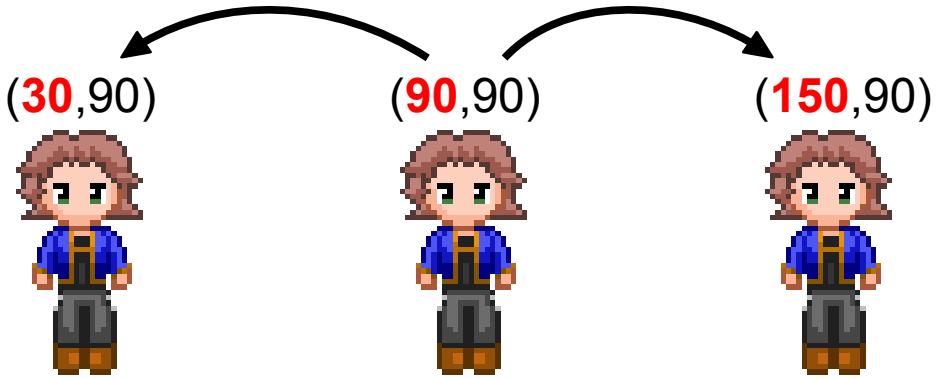


Change in x

x = x + 1

- To go right, **x** ~~should get~~ **bigger**

- To go left, **x** should get **smaller**



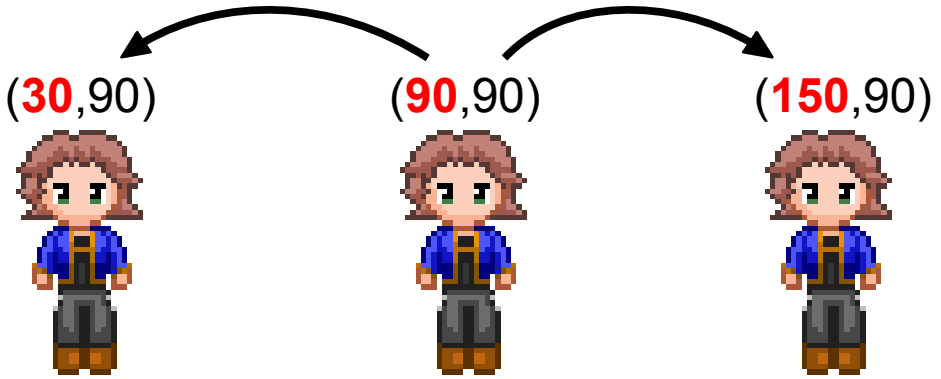
Change in x

- To go right, **x** should get **bigger**

x = x + 1

- To go left, **x** should get **smaller**

x = x - 1



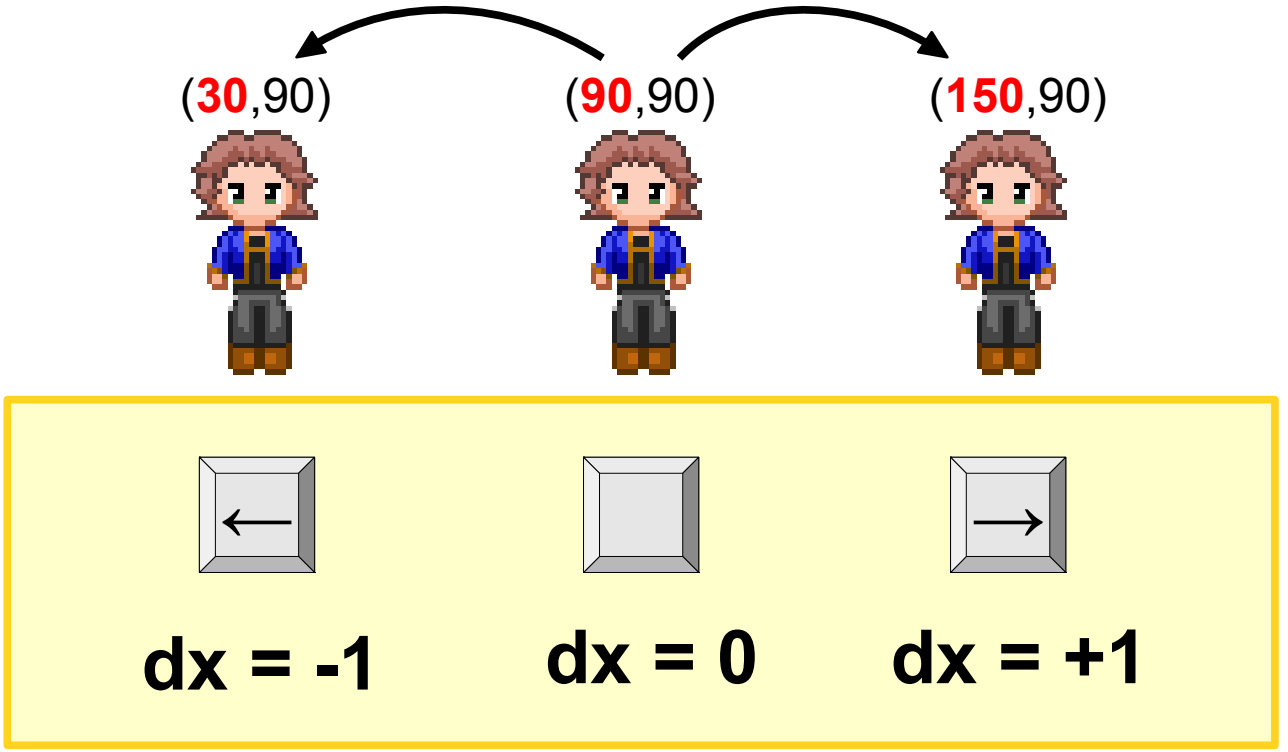
Keyboard

- To go right, **x** should get **bigger**

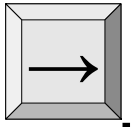
x = x + 1

- To go left, **x** should get **smaller**

x = x - 1



Keyboard

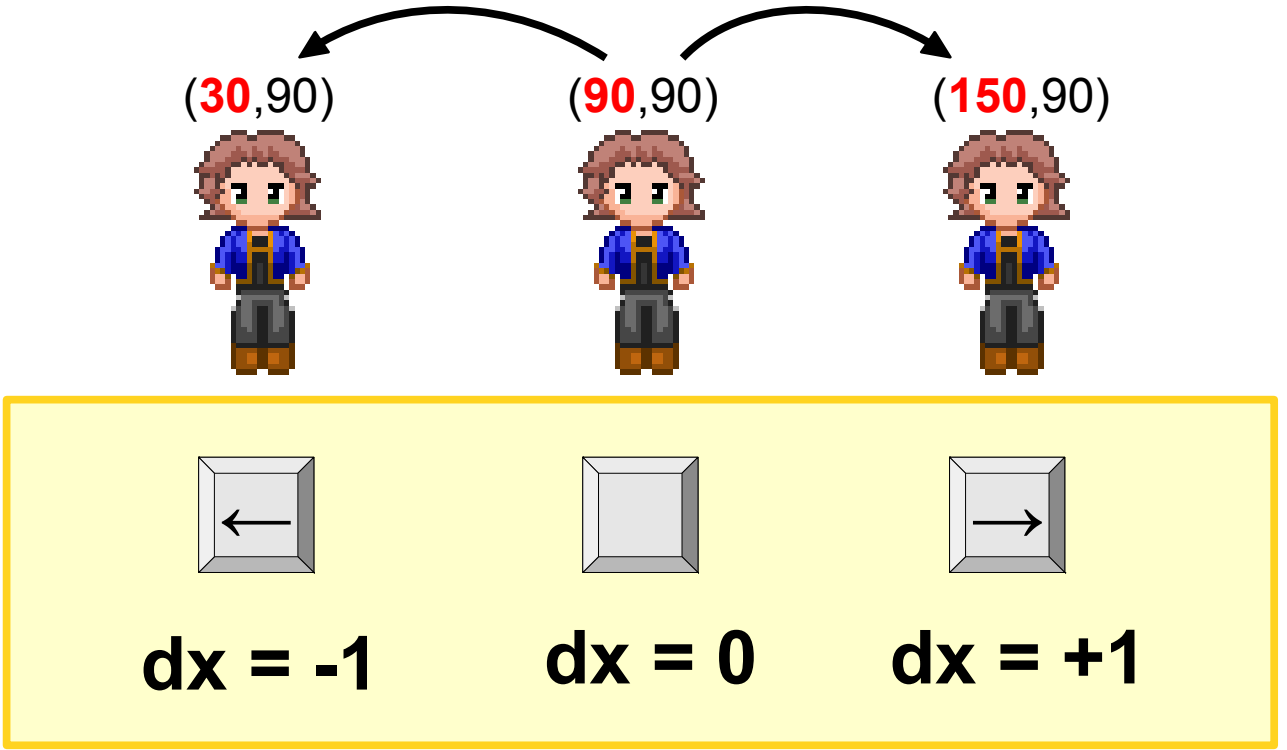


- To go right, **x** should get **bigger**

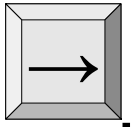
x = x + 1

- To go left, **x** should get **smaller**

x = x - 1



Keyboard

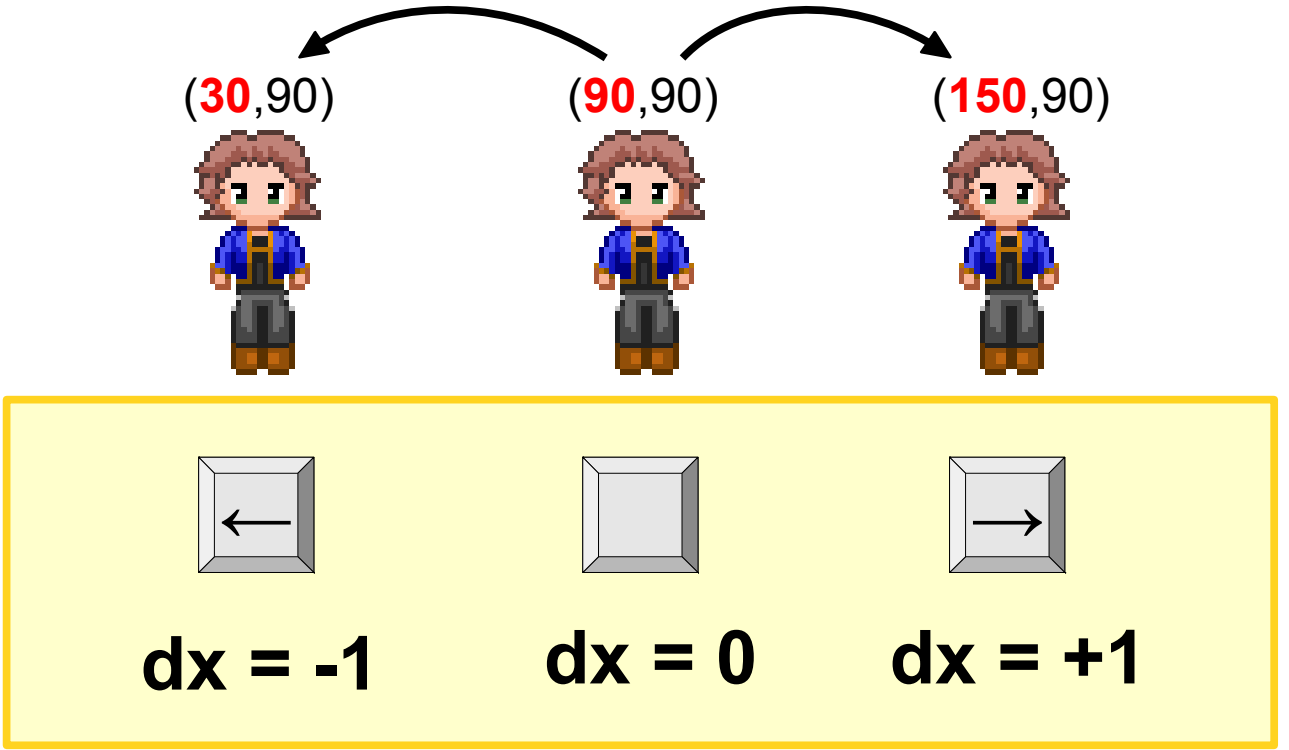


- To go right, **x** should get **bigger**

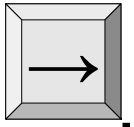
x = x + 1 **dx**

- To go left, **x** should get **smaller**

x = x - 1

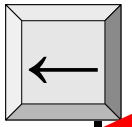


Keyboard



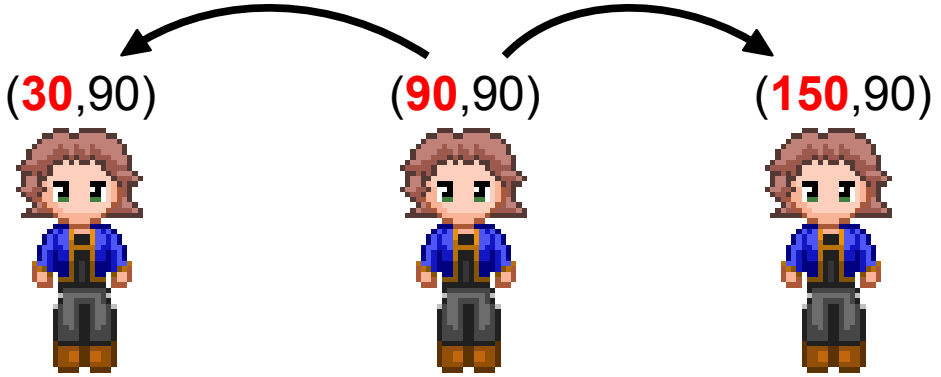
- To go right, **x** should get **bigger**

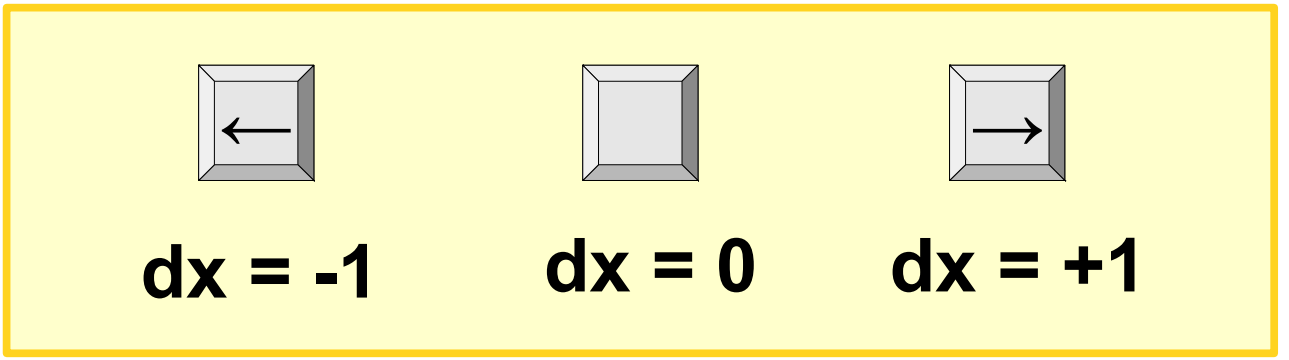
x = x + 1 dx



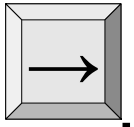
- To go left, **x** should get **smaller**

x = x - 1



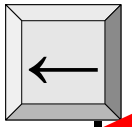


Keyboard



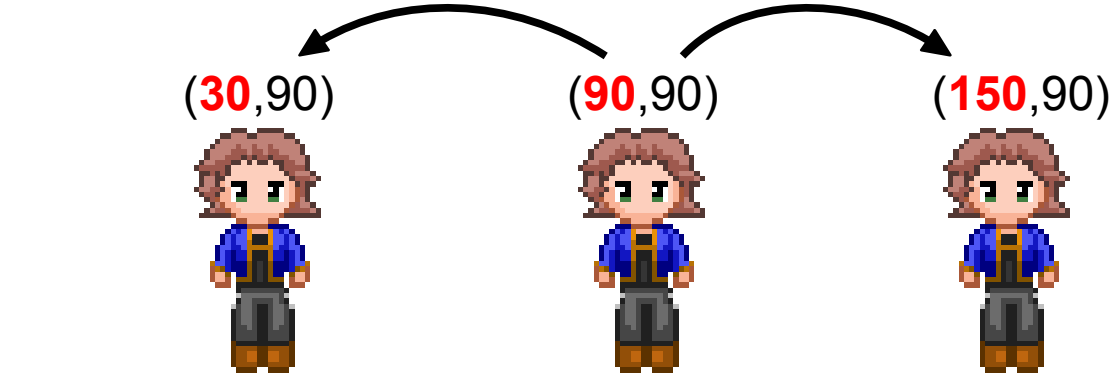
- To go right, **x** should get **bigger**

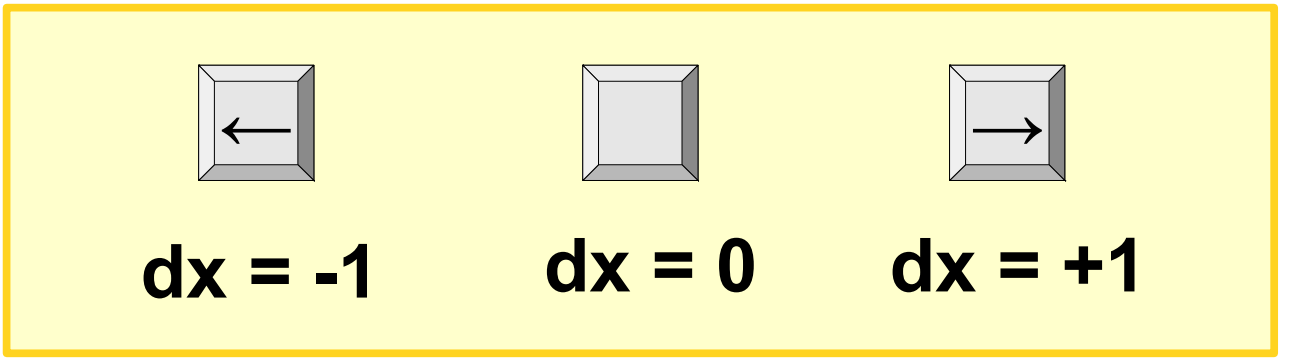
x = x + 1 dx



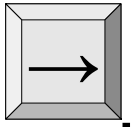
- To go left, **x** should get **smaller**

x = x − 1 + dx

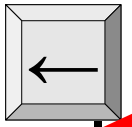




Keyboard



- To go right, **x** should get **bigger**

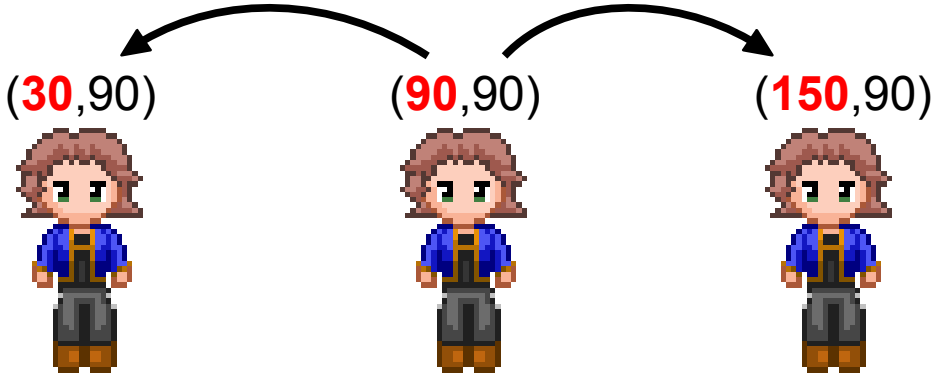


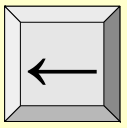
- To go left, **x** should get **smaller**

~~x = x + 1~~ ~~dx~~

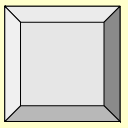
~~x = x - 1~~ ~~dx~~

x = x + dx

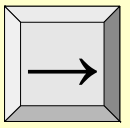




dx = -1



dx = 0



dx = +1

Keyboard: dx

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + 1;


});
```

Keyboard: dx

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {



c.clear();
c.drawImage(a, x,50);
x = x + 1;



});
```

Keyboard: dx

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + dx;

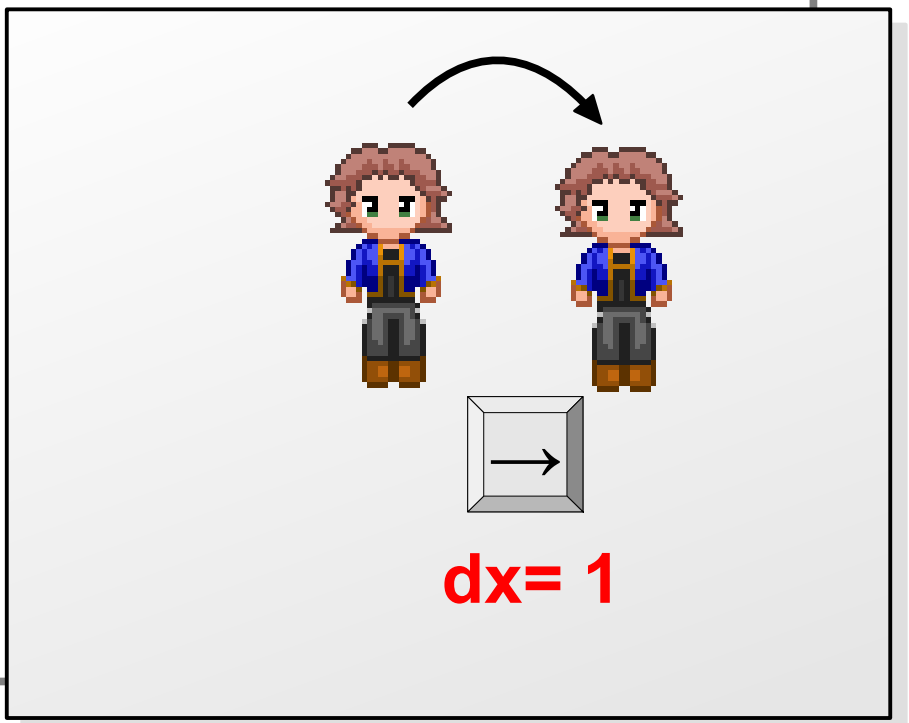

});
```

Keyboard: dx

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + dx;


});
```

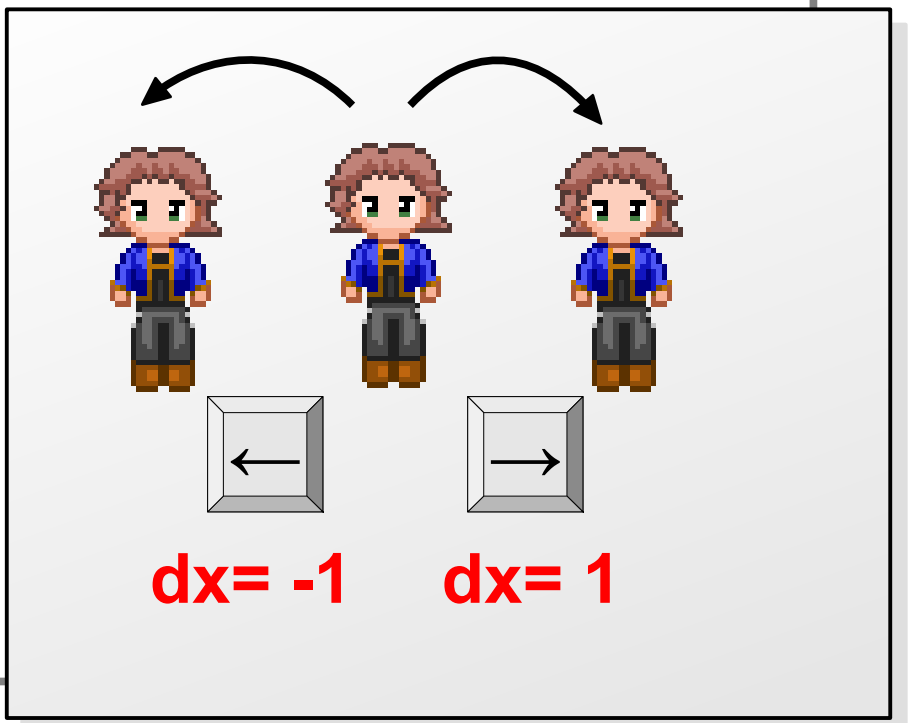


Keyboard: dx

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {


c.clear();
c.drawImage(a, x,50);
x = x + dx;


});
```



Click on Canvas to Use Keyboard

JS Bin Add library Share HTML CSS JavaScript Console Output

HTML ▼

```
<!DOCTYPE
html>
<canvas
id="canvas"
width="500"
height="500">
</canvas>
<script>
  canvas =
document.getE
lementById('c
anvas');
  c =
canvas.getCon
```

JavaScript ▼

```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {

c.clear();
c.drawImage(a, x,50);
x = x + dx;

});
```

Output

Run with JS

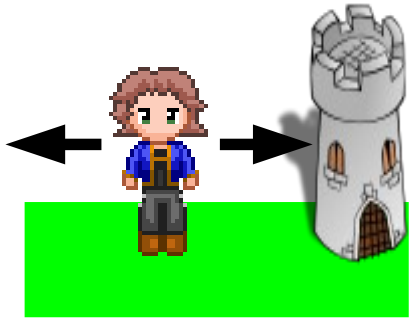
Auto-run JS

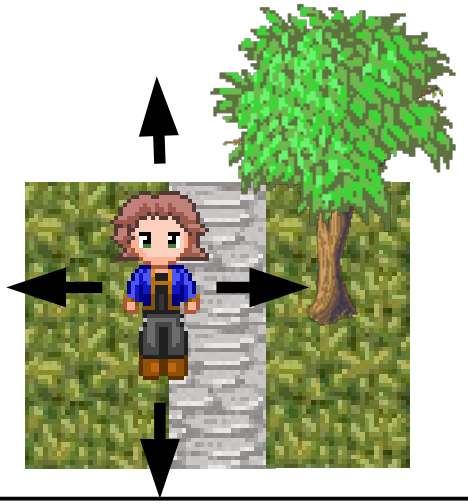
```
a = new Image();
a.src = 'http://o.ooli.ca/person.png';
x = 50;
repeat(function() {

c.clear();
c.drawImage(a, x,50);
x = x + dx;

});
```

Ideas





- Find an image
- Right-click (ctrl-click)
- Copy
  - Copy Image URL
  - Copy Image Location
  - Copy Image Address
  - Properties...Address
- Paste it

```
http://o.ooli.ca/ …
   ele.png
   dog.png
   person.png
   car_top.png
   mona.jpg
   tree.png
   leaves.png
   stone.png
   brick.png
   grass.png
```


F12


ctrl - shift⇧ J

cmd⌘ - option⌥alt - C

Driving Car

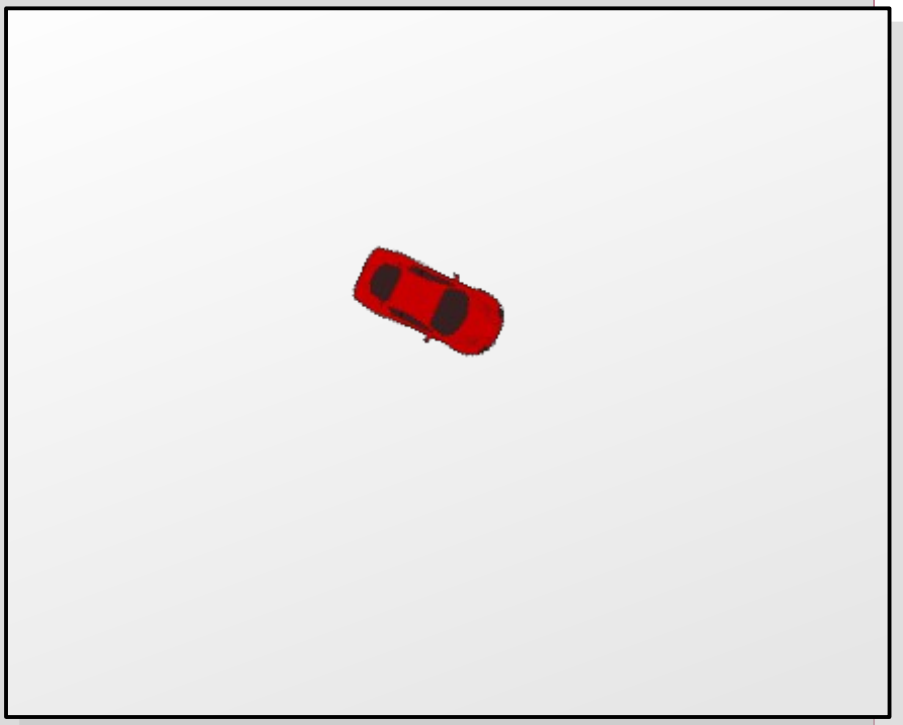
```
a = new Image();
a.src = 'http://o.ooli.ca/car_top.png';
x = 50;
y = 50;
angle = 0;
repeat(function() {

angle = angle + dx;
x = x - dy * Math.cos(angle * Math.PI / 180);
y = y - dy * Math.sin(angle * Math.PI / 180);

c.clear();
c.translate(x, y);
c.rotate(angle * Math.PI / 180);
c.translate(-37, -19);
c.drawImage(a, 0, 0);

c.setTransform(1,0,0,1,0,0);  // reset

});
```



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