15-104 Introduction to Computing for Creative Practice

Fall 2020

30 Platform Game

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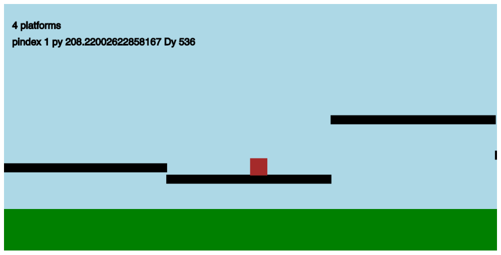
A platform game



```
4 platforms
pindex 1 py 208.22002622858167 Dy 536
```

- The platforms scroll right to left.
- The character will always remain in the middle of the canvas.
- The character should jump when a key is pressed.
- If the character is in the air, it will fall.
- If the character lands on a platform, it is safe.
- If the character falls to the bottom, it will "die".
  (but in our game, it will re-emerge, falling from the sky)

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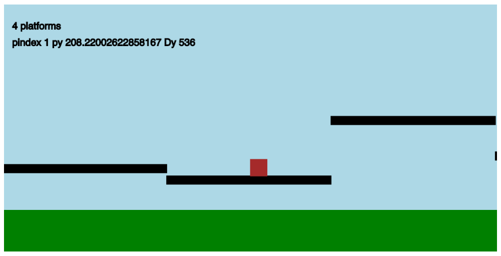
Platform

- Each platform will be an object with three data fields:
  x: horizontal location (top left)
  y: vertical location (top left)
  w: width of platform
- Methods:
  right – returns the x location of the right end of the platform

  (All platforms will have a thickness of 10 pixels.)



```
4 platforms
pindex 1 py 208.22002622858167 Dy 536
```

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Platform Code

```
function newPlatform(px, py, pw) {
    var p = {x: px, y: py, w: pw,
             right: platRight};
    return p;
}

// compute the location of the right end of a platform
function platRight() {
    return this.x + this.w;
}
```

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Setting up the game

```
var platforms = [];      // array of platforms

// To scroll, we will increment offset.
// Everything is shifted left by offset
var offset = 0;

function setup() {
    createCanvas(600, 300);
    // first platform:
    var pl = newPlatform(600, 200, 200);
    platforms.push(pl);
}
```

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Drawing the game

```
function draw() {
    background("lightblue");          // the sky
    fill("green"); stroke("green");
    rect(0, height - 50, width, 50); // the ground
    fill(0); stroke(0);
    for (var i = 0; i < platforms.length; i++) {
        var p = platforms[i];
        rect(p.x - offset, p.y, p.w, 10);
    }
    // UPDATE PLATFORM ARRAY HERE (next slide)
    offset += 1;
}
```

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Update Platform Array

```
// if first platform is offscreen to left, remove it
if (platforms.length > 0 && platforms[0].right() < offset) {
    platforms.shift();
}

// if last platform is totally within canvas, make a new one
var lastPlat = platforms[platforms.length-1];
if (lastPlat.right() - offset < width) {
    var p = newPlatform(lastPlat.right(), // start location
              random(50, 225), // height of new platform
              200); // all platforms have width 200 for now
        platforms.push(p); // add to our array of platforms
}
```

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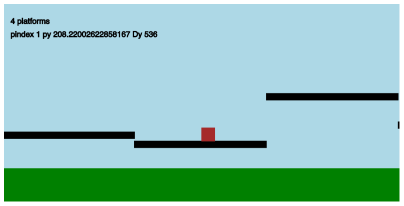
Adding the Character



```
4 platforms
pindex 1 py 208.22002622858167 Dy 536
```

- We always draw the character in the middle of the canvas, so we only worry about the vertical (Y) coordinate.
- We need to find which platform is currently in the middle of the screen, so we do a *linear* search to find it.
- Then we move the character based on whether it is above, on, or below the relevant platform.
- The character automatically “wraps around” when it falls, which means we need no interaction to do some testing.

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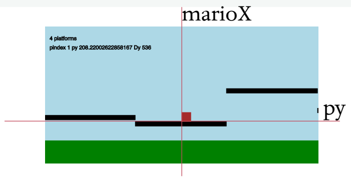
Finding platform in middle



```
4 platforms
pindex 1 py 208.22002622858167 Dy 536
```

```
var i = 0;
var marioX = width / 2;
while (platforms[i].right() - offset < marioX) {
    i += 1;
}
var py = platforms[i].y;  // height of middle platform
```

`platforms`	is the array of platforms
`platforms[i]`	is the ith platform in the array of platforms
`platforms[i].right()`	is the method of the ith platform in the array of platforms that returns its right coordinate.
`platforms[i].y`	is the y-value of the ith platform in the array of platforms

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Moving and drawing the character

```
var marioY = 0;   // new global variable, start char. at top
--------------------------------------------------------------
if (marioY <= py) { // above or on the platform, stop at py
    marioY = min(py, marioY + 1);
} else { // below the platform, stop at height (fall to bottom)
    marioY = min(height, marioY + 1);
}
if (marioY >= height) {   // if char. hits bottom, reset to top
    marioY = 0;
}
// draw the "mario"
fill("brown");
stroke("brown");
rect(marioX, marioY - 20, 20, 20);
```

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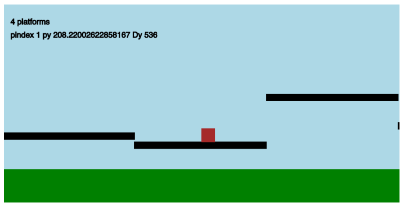
Adding a Jump feature



```
4 platforms
pindex 1 py 208.22002622858167 Dy 536
```

- To implement jumping, we start by adding `marioDy`, which is the velocity of the "mario" character.
- New global variable:

  `var marioDy = 0;`

  for the vertical velocity of the character:

zero:	floating
positive:	falling
negative:	rising

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Rising and Falling

```
if (marioY <= py) { // above or on platform
    marioY = min(py, marioY + marioDy);
} else {  // below platform
    // we don't want upward movement
    if (marioDy < 0) {
        marioDy = 0;
    }
    marioY = min(height, marioY + marioDy);
}
if (marioY >= height) {
    marioY = 0; marioDy = 0;
}
```

If `marioDy > 0`, then "mario" is falling (y will increase).
If `marioDy < 0`, then "mario" is rising (jumping).

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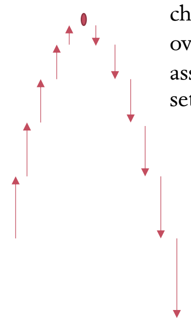
Updating platform and “mario”

```
   // move the "landscape"
    offset += 1;
    // accelerate "mario" with gravity
    marioDy = marioDy + 1;
```

Making “mario” jump:

```
function keyPressed() {
    marioDy = -10;
}
```



Example of how `marioY` changes due to `marioDy` over repetitions of `draw` assuming a key press sets `marioDy` to `-5`.

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Fix This

- When the character lands on the platform, marioDy continues to increase. Fix this.
- When the character jumps, if its right edge touches the next platform, it still falls. Fix this.

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