Randomness & Events

An Interesting Website

www.boxcar2d.com

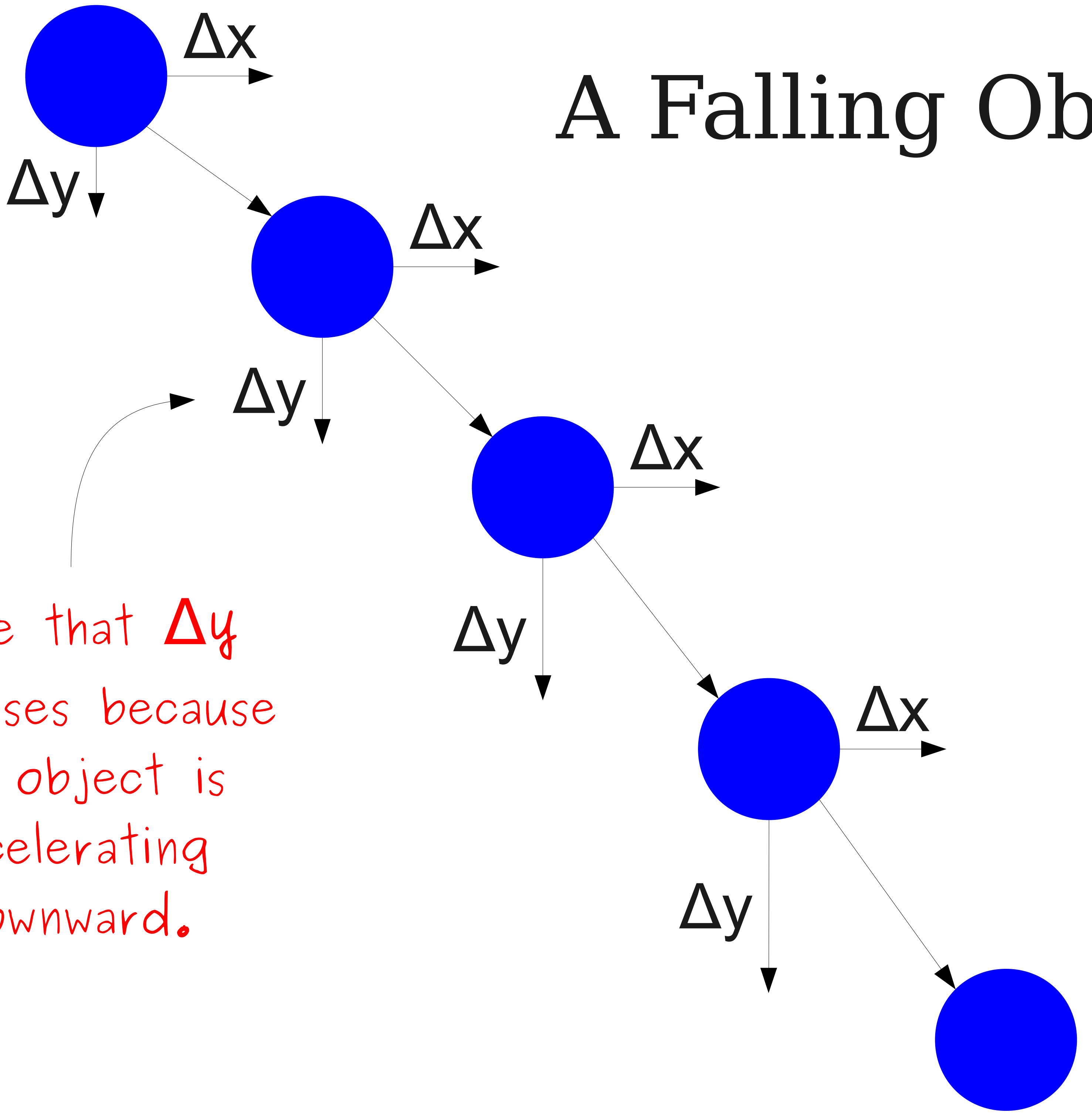
Animation

- By repositioning objects after they have been added to the canvas, we can create animations.
- General pattern for animation:

```
while (not-done-condition) {
    update graphics
    pause(pause-time);
}
```

Physics Simulation

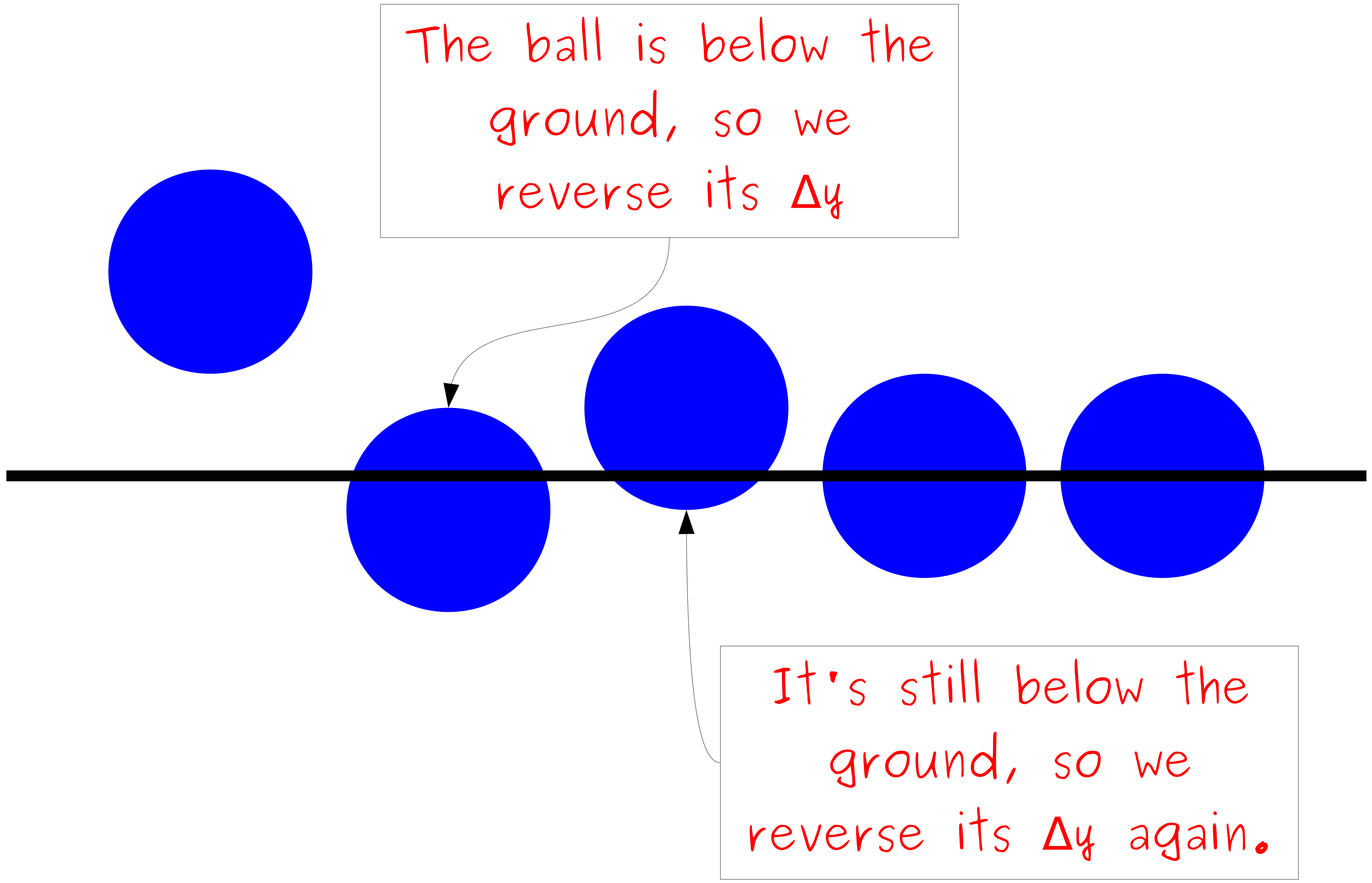
A Falling Object



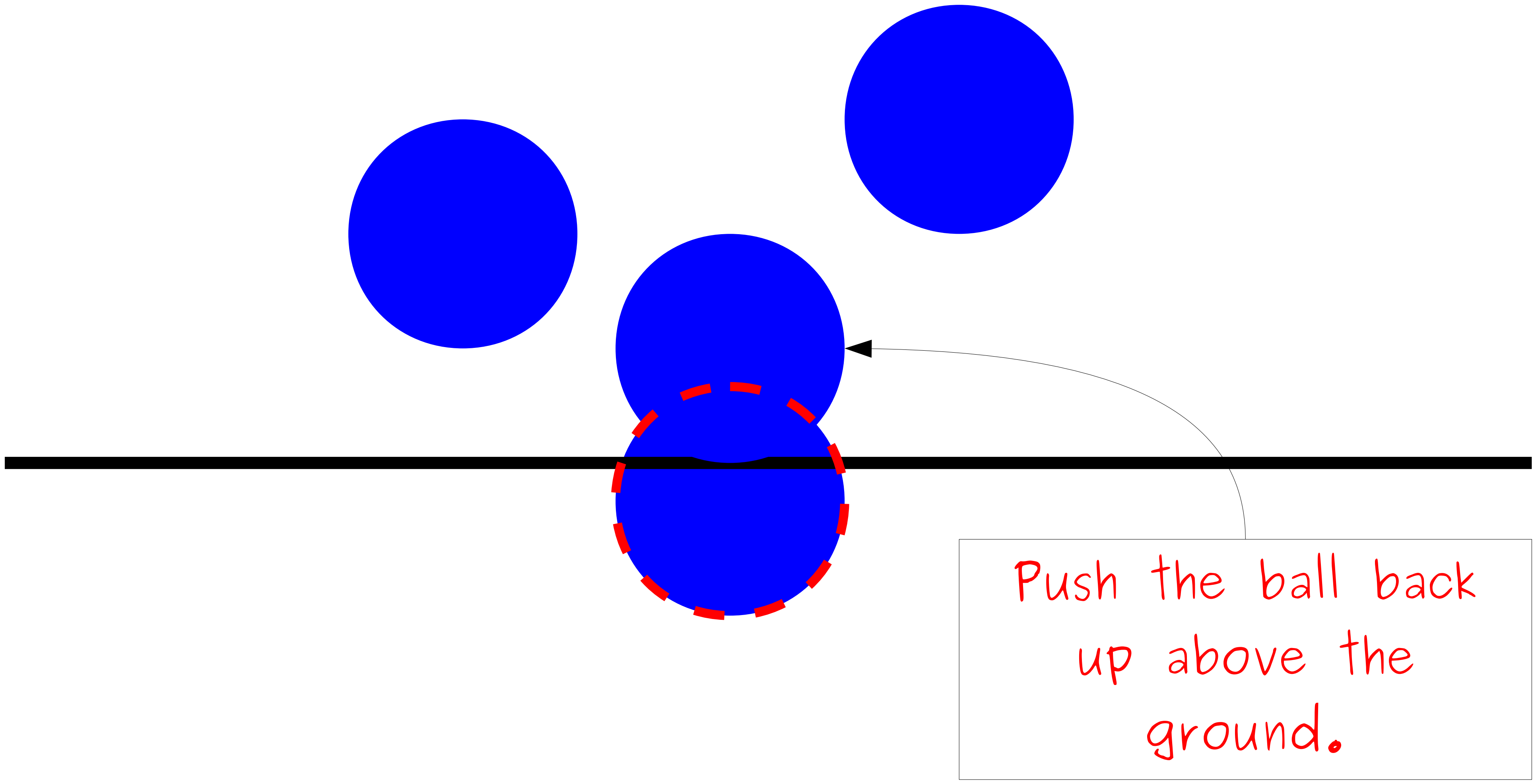
Note that Δy increases because the object is accelerating downward.

From Last Time…

A Sticky Situation


The ball is below the ground, so we reverse its Δy
It's still below the ground, so we reverse its Δy again.

Unsticking the Situation



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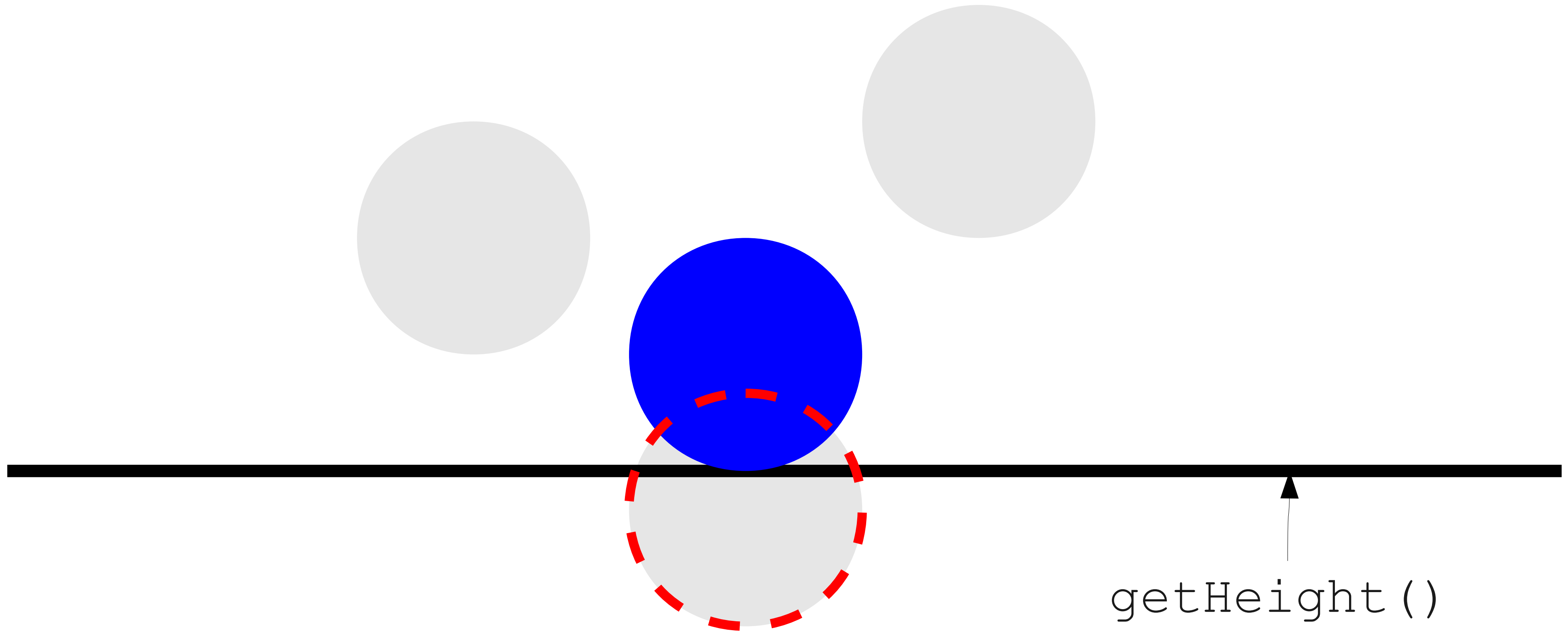
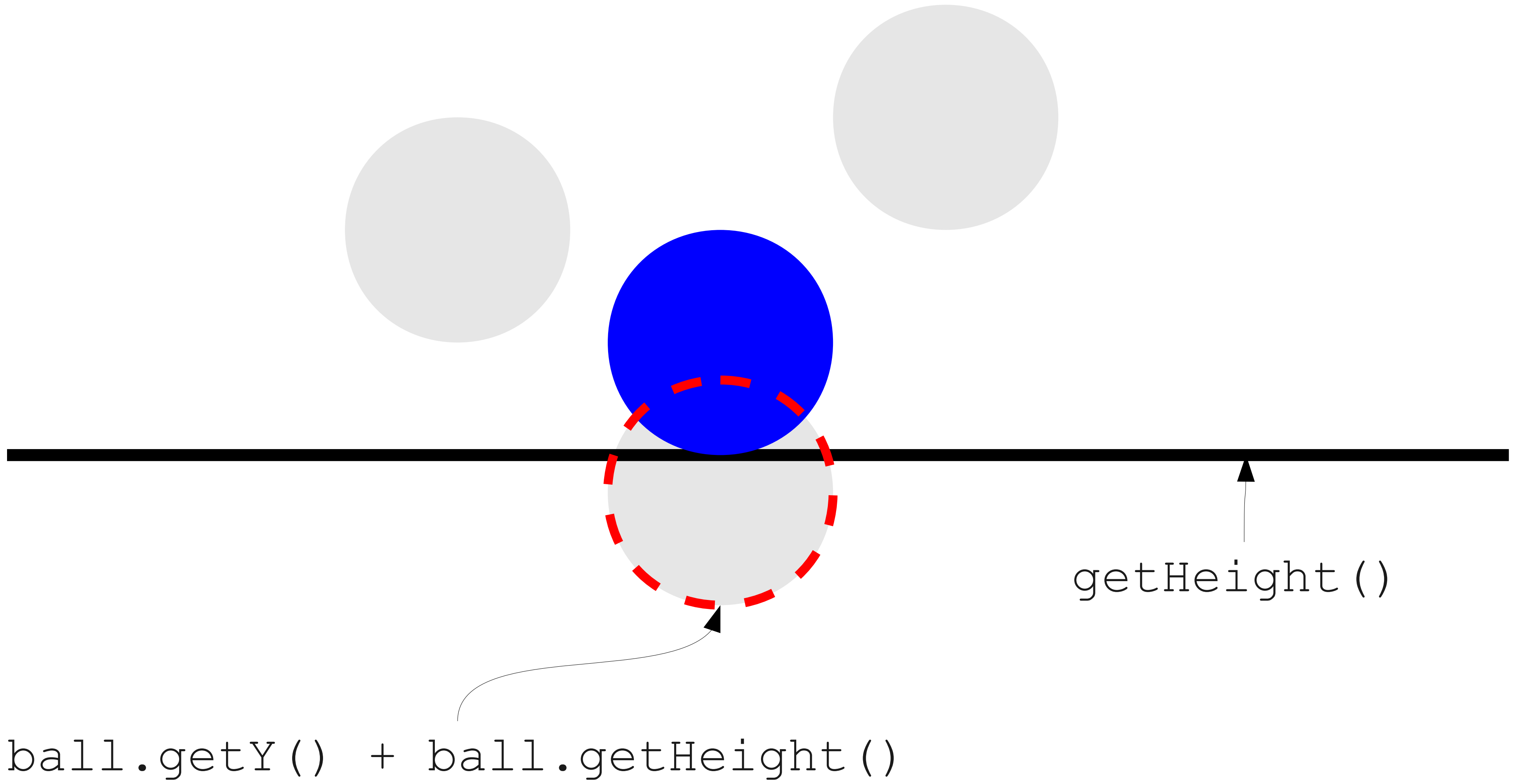


Unsticking the Situation

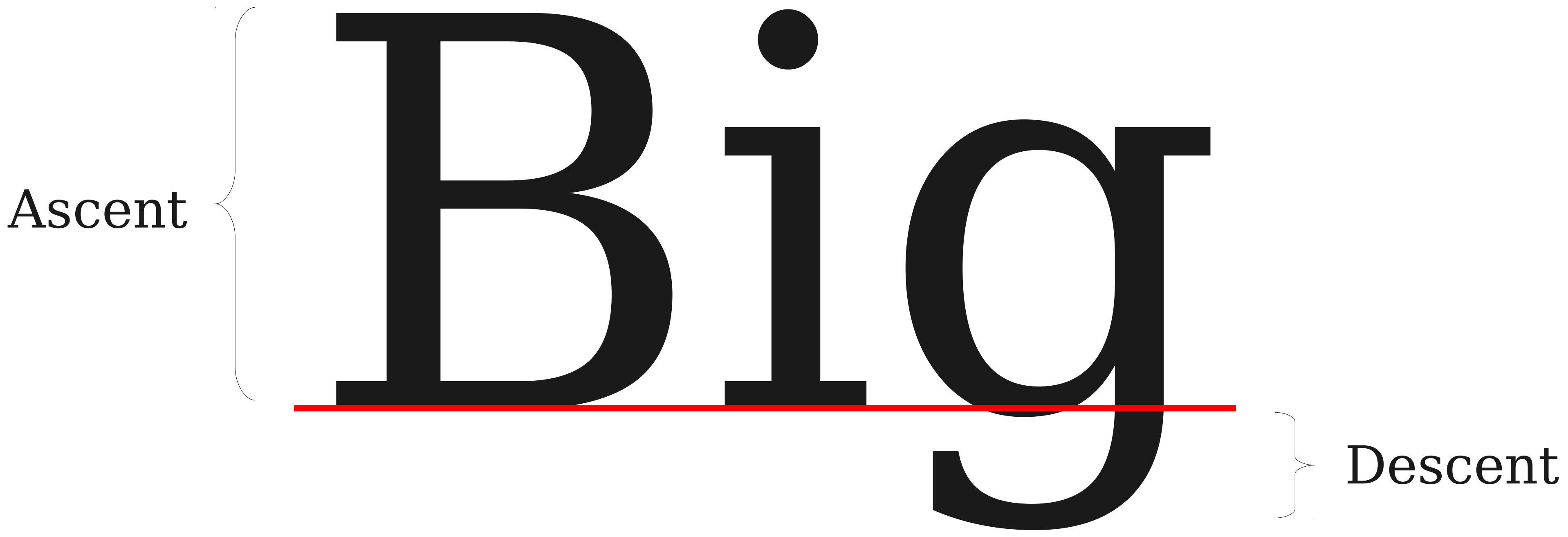


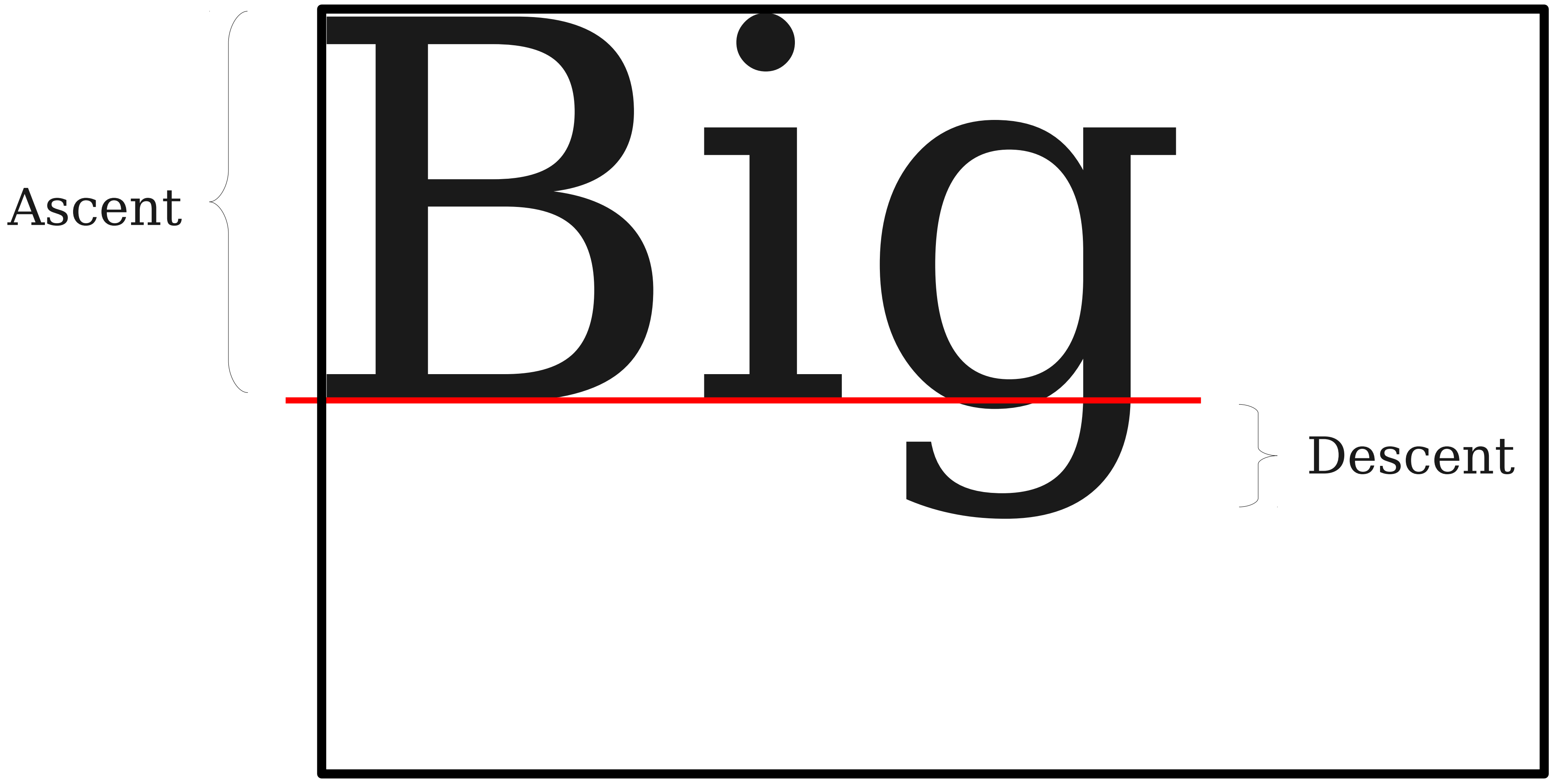
Being Random

Random Number Generators

`RandomGenerator`

- The class **`RandomGenerator`** acts as a random number generator.
  - Need to **`import acm.util.*;`**
- An instance of **`RandomGenerator`** can be used to generate random numbers.


Ascent
Big
Descent


Ascent
Big
Descent

Events

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- An **event** is some external stimulus that your program can respond to.
- Common events include:
  - Mouse motion / clicking.
  - Keyboard buttons pressed.
  - Timers expiring.
  - Network data available.

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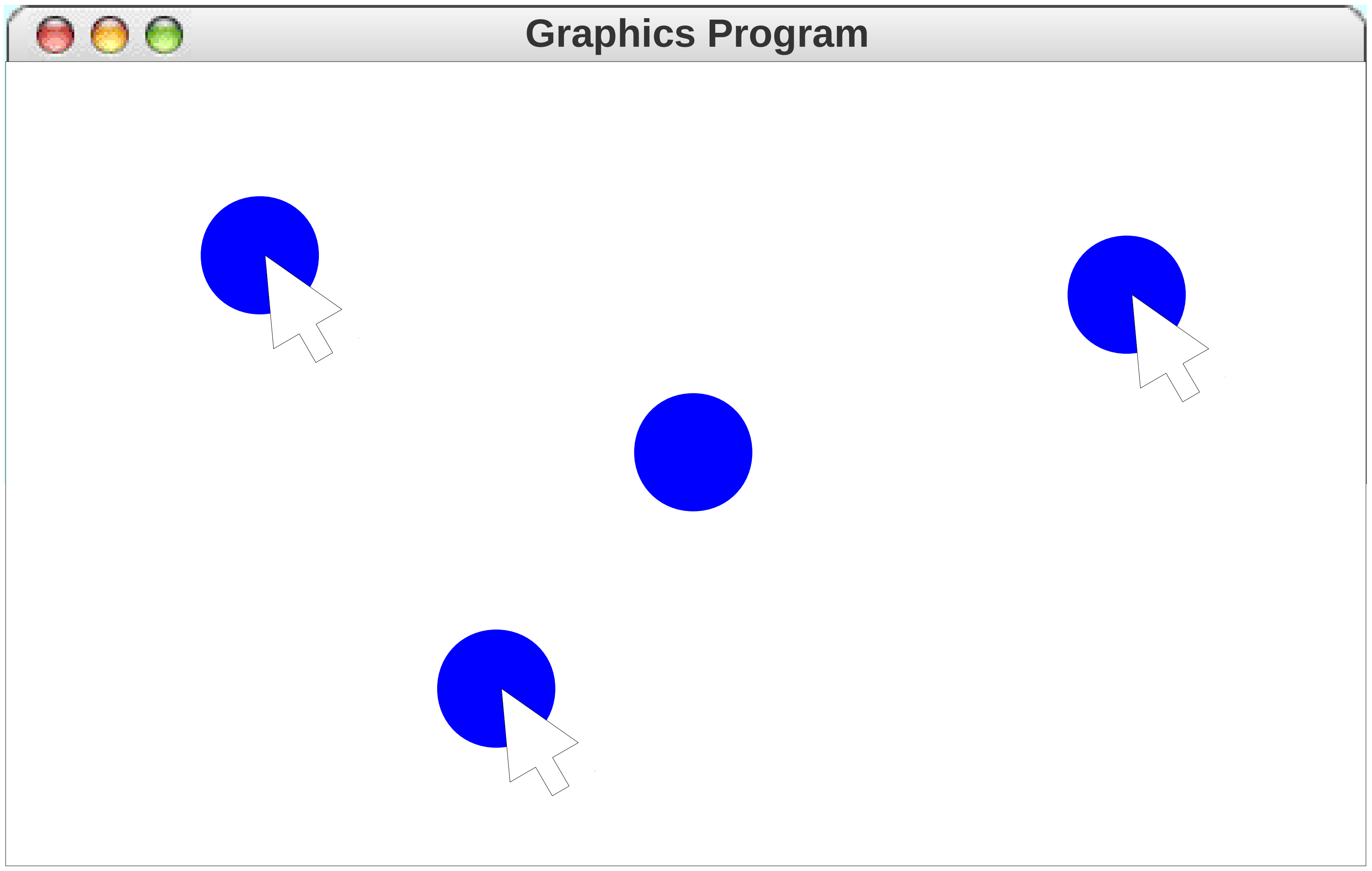
Responding to Mouse Events

- To respond to events, your program must
  - Indicate that it wants to receive events, and
  - Write methods to handle those events.
- Call the **`addMouseListeners()`** method to have your program receive mouse events.
- Write appropriate methods to process the mouse events.

Methods for Handling Events

- Define any or all of the following mouse event handlers to respond to the mouse:
  - `public void mouseMoved(MouseEvent e)`
  - `public void mouseDragged(MouseEvent e)`
  - `public void mousePressed(MouseEvent e)`
  - `public void mouseReleased(MouseEvent e)`
  - `public void mouseClicked(MouseEvent e)`
  - `public void mouseEntered(MouseEvent e)`
  - `public void mouseExited(MouseEvent e)`
- You must also `import java.awt.event.*;` for the **`MouseEvent`** class.

A Friendly Circle



Let's Code it Up!

A Problem of Scoping

- The **`mouseMoved`** handler has no way of referring to the existing circle because it is a local variable in a different method.
- How do we make it possible for the listener to know about the circle?

Instance Variables

- An **instance variable** (sometimes called a **field**) is a variable that can be read or written by any of the methods of a class.
- Syntax (defined outside of any method):

```
private type name;
```

- Instance variables are used to store information that
  - Must persist throughout the program, and
  - Cannot be stored as local variables or parameters.

The Importance of Style

- General rule of thumb:

  Don't make a variable an instance variable unless you have to.

- Use local variables for temporary information.
- Use parameters to communicate data into a method.
- Use return values to communicate data out of a method.