Using Random Numbers

Why?
- Games
- Serious simulations
- Visual effects
- Obfuscation

There are two standard ways to get random number
- Use `random()` method of `Math` class.
- Use `Random` class
- Both use same underlying arithmetic.
- Pseudo-random Numbers

Using `Math.random()`
- Returns `double` in range $0 \leq n < 1.0$
  - Does not include 1.0!
- Simulate Die Roll
  ```java
  int roll = 1 + (int) (Math.random() * 6);
  ```
Using Random Numbers

- Why use Random Class?
  - Provides many methods that are convenient to use.
  - Serious simulations
  - Visual effects
  - Obfuscation

- Twenty-sided Die

  Random gen = new Random();
  int roll = 1 + gen.nextInt(20);

- Some Other Methods Provided
  - int nextDouble()
  - long nextLong()
  - int nextInt()
  - boolean nextBoolean()

- void setSeed(long n)  Why?
Using Random Numbers

Think of ways to use random numbers in Image processing

1. ?
2. ?
3. ?
4. ?
5. ?
6. ?
7. ?
String Methods

- There are many useful methods
  - The one used most frequently are summarized below
  - Make sure you understand the notations and what is means!
    - `int length()`  
    - `boolean equals(String s)`  
    - `int compareTo(String s)` // -1, 0, +1 : <, ==, >
    - `String substring(int begin, int end)`  
    - `String substring(int begin)`  
    - `int indexOf(String key)` // -1 if not found
    - `char charAt(int position)`
  - Example. What are the values?
    - String `demo = "How are things?";`
    - `demo.substring(8, 12)`
    - `demo.indexOf("wa")`
    - `demo.indexOf("w a")`
    - `demo.charAt(7);`
    - `demo.compareTo("how are things?")`
Lab Today - Animation

- Canvas

- (0,0)
Canvas Details

❖ What are the dimensions of the Canvas?
   - java.awt.Dimension

❖ Creating the Canvas

   final java.awt.Dimension SIZE =
     new java.awt.Dimension(600, 600);
   Canvas display = new Canvas(SIZE);

❖ Accessing the dimensions

   int height = SIZE.height;
   int width = SIZE.width;
Paint a circle

- Center of the screen
  - Point \((x, y)\)
  - `java.awt.Point`
    
    ```java
    Point center = new Point(? , ?);
    ```

- Pen
  - Set the color
    ```java
    java.awt.Color.RED
    ```
  - Fill the oval
Paint a Circle (cont)

- Canvas has a special method
  - `paintComponent`
  - (must spell it exactly this way)
  - This method is automatically invoked when an event occurs
    - When `main` sets `isVisible` to `true`
    - When a window is resized
Lab today

- Modify the Canvas class to get the circle to move
- Modify the Canvas class to get the circle to bounce inside the canvas
- Add a new class Bouncer to create a circle that bounces
- Create two bouncing circles