


**Computer Science Department
presents**



**Pumpkin Carving
Contest 2008**

Thursday, October 16, 2008
6:00 pm — 222 Clapp

All majors, minors, and prospective Computer
Science majors/minors are welcome and
encouraged to come to this fun event! Carve
your own pumpkin, then vote on whose
pumpkin is best!

Prizes for first, second, and third places!
Please RSVP to wqueros@mitpolyoke.edu

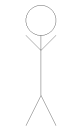
1

**Centering, Colors,
Randomness**

October 16, 2008

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Stick Figure Revisited

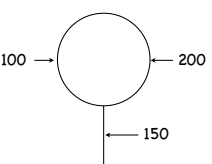


Notice that the body is centered underneath the
head

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Stick Figure Revisited

```
private static final int HEAD_SIZE = 100;  
private static final int HEAD_LEFT = 100;
```

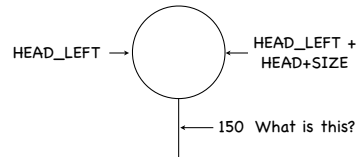


100 → ← 200
← 150

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Stick Figure Revisited

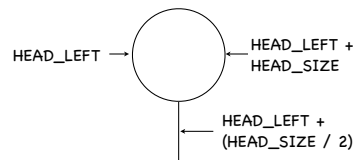
```
private static final int HEAD_SIZE = 100;  
private static final int HEAD_LEFT = 100;
```



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Stick Figure Revisited

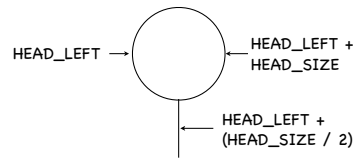
```
private static final int HEAD_SIZE = 100;  
private static final int HEAD_LEFT = 100;
```



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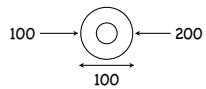
Stick Figure Revisited

```
private static final int HEAD_SIZE = 100;  
private static final int HEAD_LEFT = 100;  
private static final int BODY_LEFT = HEAD_LEFT + (HEAD_SIZE / 2);
```



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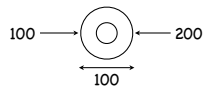
Centering 2D Shapes



Assuming the diameter of the inner circle is 1/2 the diameter of the outer circle, where should we draw the inner circle?

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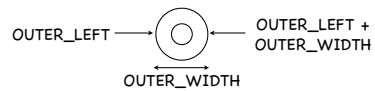
Centering 2D Shapes



1. What is the x coordinate of the center of the outer circle? 150
2. What is the x coordinate of the center of the inner circle? 150
3. What is the x coordinate of the left of the inner circle? 125

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Centering 2D Shapes



1. What is the x coordinate of the center of the outer circle? $OUTER_LEFT + (OUTER_WIDTH / 2)$
2. What is the x coordinate of the center of the inner circle? $OUTER_LEFT + (OUTER_WIDTH / 2)$
3. What is the x coordinate of the left of the inner circle?
 $OUTER_LEFT + (OUTER_WIDTH / 2) - (INNER_WIDTH / 2)$

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Doughnut

```
public class Doughnut {
    private static final int OUTER_LEFT = 100;
    private static final int OUTER_TOP = 100;
    private static final int OUTER_SIZE = 100;

    private static final int INNER_SIZE = OUTER_SIZE / 2 ;
    private static final int INNER_LEFT = OUTER_LEFT +
        (OUTER_SIZE / 2) - (INNER_SIZE / 2);
    private static final int INNER_TOP = OUTER_TOP +
        (OUTER_SIZE / 2) - (INNER_SIZE / 2);

    public Doughnut (DrawingCanvas doughnutCanvas) {
        new FramedOval (OUTER_LEFT, OUTER_TOP, OUTER_SIZE,
            OUTER_SIZE, doughnutCanvas);
        new FramedOval (INNER_LEFT, INNER_TOP, INNER_SIZE,
            INNER_SIZE, doughnutCanvas);
    }
}
```

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Setting the Color of a Shape

```
FilledRect rect = new FilledRect (50, 200, 150, 100, canvas);
rect.setColor (Color.GREEN);
```

```
FramedRect frame = new FramedRect (50, 200, 150, 100, canvas);
frame.setColor (Color.GREEN);
```



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Colors in Java

⊗ A few colors have names:

BLACK BLUE CYAN DARK_GRAY
GRAY GREEN LIGHT_GRAY MAGENTA
ORANGE PINK RED WHITE
YELLOW

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```
import objectdraw.*;
import java.awt.Color;

public class House
{
    // Size and location constants elided
    ...
    // Colors of the house
    private static final Color WALL_COLOR = Color.RED;
    private static final Color DOOR_COLOR = Color.YELLOW;

    public House (DrawingCanvas mysteryCanvas) {
        FilledRect wall = new FilledRect (...);
        wall.setColor (WALL_COLOR);
        FilledRect door = new FilledRect (...);
        door.setColor (DOOR_COLOR);
    }
    ...
}
```

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```
import objectdraw.*;
import java.awt.Color;

public class House
{
    // Size and location constants elided
    ...
    // Colors of the house
    private static final Color WALL_COLOR = Color.RED;
    private static final Color DOOR_COLOR = Color.YELLOW;

    public House (DrawingCanvas mysteryCanvas) {
        FilledRect wall = new FilledRect (...);
        wall.setColor (WALL_COLOR);
        FilledRect door = new FilledRect (...);
        door.setColor (DOOR_COLOR);
    }
    ...
}
```

Tell Java where Color
is defined.

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```
import objectdraw.*;
import java.awt.Color;

public class House
{
    // Size and location constants elided
    ...
    // Colors of the house
    private static final Color WALL_COLOR = Color.RED;
    private static final Color DOOR_COLOR = Color.YELLOW;

    public House (DrawingCanvas mysteryCanvas) {
        FilledRect wall = new FilledRect (...);
        wall.setColor (WALL_COLOR);
        FilledRect door = new FilledRect (...);
        door.setColor (DOOR_COLOR);
    }
    ...
}
```

Define constants for
the colors

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```

import objectdraw.*;
import java.awt.Color;

public class House
{
    // Size and location constants elided
    ...
    // Colors of the house
    private static final Color WALL_COLOR = Color.RED;
    private static final Color DOOR_COLOR = Color.YELLOW;

    public House (DrawingCanvas mysteryCanvas) {
        FilledRect wall = new FilledRect (...);
        wall.setColor (WALL_COLOR);
        FilledRect door = new FilledRect (...);
        door.setColor (DOOR_COLOR);
        ...
    }
}

```

Save the objects to color in variables

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```

import objectdraw.*;
import java.awt.Color;

public class House
{
    // Size and location constants elided
    ...
    // Colors of the house
    private static final Color WALL_COLOR = Color.RED;
    private static final Color DOOR_COLOR = Color.YELLOW;

    public House (DrawingCanvas mysteryCanvas) {
        FilledRect wall = new FilledRect (...);
        wall.setColor (WALL_COLOR);
        FilledRect door = new FilledRect (...);
        door.setColor (DOOR_COLOR);
        ...
    }
}

```

Change the color of the objects

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What is a Color?

- RGB – Red Green Blue
 - 3 light sources, one of each color
 - Specify how intense each light source should be
 - Values range between 0 and 255
 - Example: Red = 129, Green = 202, Blue = 60
 - Example: Red = 245, Green = 248, Blue = 34
 - What is black, white, gray?

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Using Colors other than the Named Colors

```

private static final Color WALL_COLOR =
    new Color (254, 255, 212); // cream color

private static final Color DOOR_COLOR =
    new Color (95, 83, 61); // dark brown

```

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Why 255???

- Computer memory uses binary
- In binary, there are just 2 values: 0 and 1
- Easy to implement physically: positive or negative magnetic charge
- A bit is a unit of memory that can hold a single binary digit (0 or 1)
- A byte is a unit of memory that can hold 8 bits, the values 00000000 to 11111111
- What is binary 00000000 in decimal?
- What is binary 11111111 in decimal?

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Decimal & Binary

- Decimal:
 - Digits range from 0 to 9
 - Position determines power of 10
 - $134 = 1 * 10^2 + 3 * 10^1 + 4 * 10^0$
- Binary:
 - Digits range from 0 to 1
 - Position determines power of 2
 - $101 = 1 * 2^2 + 0 * 2^1 + 1 * 2^0 = 5$ in decimal
 - $11111111 = 1 * 2^7 + 1 * 2^6 + 1 * 2^5 + 1 * 2^4 + 1 * 2^3 + 1 * 2^2 + 1 * 2^1 + 1 * 2^0 = 255$ in decimal

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Randomness

- In Alice:
 - Random boolean:
`if (Random.nextBoolean())`
 - Random number:
`randomNum.set (value, Random.nextDouble()
minimum = 1 maximum = 11 integerOnly = true);`

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Randomness

- In Java - 2 steps:
 1. Construct a random number generator:
`RandomIntGenerator generator = new RandomIntGenerator (1, 10);`
 2. Generate a random number:
`int randomNum = generator.nextValue();`

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Random Number Example

```
public void roll () {
    RandomIntGenerator dieRoller = new RandomIntGenerator (1, 6);
    int die1 = dieRoller.nextValue();
    int die2 = dieRoller.nextValue();
    int diceValue = die1 + die2;

    System.out.println ("You rolled " + diceValue);
}
```

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Creating a Random Color

```
public void begin() {
    // Create the random number generator
    RandomIntGenerator colorGen =
        new RandomIntGenerator (0, 255);

    // Generate the RGB values
    int redness = colorGen.nextValue();
    int blueness = colorGen.nextValue();
    int greenness = colorGen.nextValue();

    // Create the color
    Color wallColor = new Color (redness, blueness, greenness);
    FilledRect wall = new FilledRect (...);

    // Use the color
    wall.setColor (wallColor);
}
```

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Summary

- Use constants ("private static final ...") instead of literals (like 10)
- Define constants in terms of each other when possible
- Construct objects by saying "new" and the type of object to construct and its parameters
- Save objects in variables with assignment statements: "Thingy variable = new Thingy (parameters);"
- Call methods by saying "variable.method (parameters);"

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