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CS 106J

Handout #26A
May 5, 2017

Solutions to Practice Midterm #1

Please remember that the midterm is open-book.
Tuesday, May 9, 3:30–5:30 P.M., 200-030
Tuesday, May 9, 7:00–9:00 P.M., 380-380Y

Problem 1: Karel the Robot (10 points)

```
/*
 * File: BreakoutKarel.k
 * ---------------------
 * The BreakoutKarel program plays a simplified form of Breakout.
 */

import "turns";

/* Main program */

function Breakout() {
   while (beepersInBag()) {
      if (beepersPresent()) {
         pickBeeper();
         bounce();
      }
      while (frontIsBlocked()) {
         bounce();
      }
      stepDiagonally();
   }
}

/*
 * Causes Karel to perform a ricochet bounce, which requires
 * no more than turning left.
 */

function bounce() {
   turnLeft();
}

/*
 * Step diagonally.  The precondition for this call is that
 * Karel's front must be clear.  The postcondition has Karel
 * facing in the same direction.
 */

function stepDiagonally() {
   move();
   if (leftIsClear() && noBeepersPresent()) {
      turnLeft();
      move();
      turnRight();
   }
}
```

Problem 2: Simple JavaScript expressions, statements, and functions (10 points)

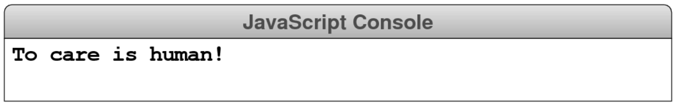
(2a) `5 % 4 - 4 % 5` –3

`7 < 9 - 5 && 3 % 0 === 3` `false`

`"B" + 3 * 4` `"B12"`

(2b) `"cabbage"`

(2c)



```
To care is human!
```

Problem 3: Simple JavaScript programs (15 points)

```
/*
 * File: PythagoreanTriples.js
 * ---------------------------
 * This program finds all sets of integers a, b, and c so that a < b <= MAX
 * and
 *
 *         2      2       2
 *       a    + b     =  c
 */

const MAX = 25;

function PythagoreanTriples() {
   for (var a = 1; a < MAX; a++) {
      for (var b = a + 1; b <= MAX; b++) {
         var csq = a * a + b * b;
         var c = Math.round(Math.sqrt(csq));
         if (c * c === csq) {
            console.log(a + ", " + b + ", " + c);
         }
      }
   }
}
```

Problem 4: Using graphics and animation (20 points)

```
/*
 * File: RedCross.js
 * -----------------
 * This program solves the practice midterm problem.
 */

import "graphics";
import "RandomLib.js";

/* Constants */

const GWINDOW_WIDTH = 500;
const GWINDOW_HEIGHT = 300;
const CROSSBAR_LENGTH = 60;
const CROSSBAR_BREADTH = 20;
const TIME_STEP = 20;
const CROSS_SPEED = 3;

/* Main program */

function RedCross() {
   var gw = GWindow(GWINDOW_WIDTH, GWINDOW_HEIGHT);
   var cross = createRedCross(CROSSBAR_LENGTH, CROSSBAR_BREADTH);
   var direction = randomReal(0, 360);
   gw.add(cross, gw.getWidth() / 2, gw.getHeight() / 2);
   var clickAction = function(e) {
       direction = randomReal(0, 360);
   };
   gw.addEventListener("click", clickAction);
   var step = function() {
      cross.movePolar(CROSS_SPEED, direction);
   };
   var timer = setInterval(step, TIME_STEP);
}

/*
 * Creates a GCompound consisting of a red cross centered at the origin.
 * The parameters length and breadth specify the larger and smaller
 * dimension of the rectangles forming the cross, respectively.
 */

function createRedCross(length, breadth) {
   var cross = GCompound();
   var horizontalBar = GRect(-length / 2, -breadth / 2, length, breadth);
   horizontalBar.setFilled(true);
   horizontalBar.setColor("Red");
   var verticalBar = GRect(-breadth / 2, -length / 2, breadth, length);
   verticalBar.setFilled(true);
   verticalBar.setColor("Red");
   cross.add(horizontalBar);
   cross.add(verticalBar);
   return cross;
}
```

Problem 5: Strings (15 points)

```
/*
 * File: AddCommas.js
 * ------------------
 * This file implements a function that adds commas to numeric strings.
 */

/*
 * Adds commas at every third position of the string starting on the
 * right.
 */

function addCommas(digits) {
   var result = "";
   var len = digits.length;
   for (var i = 0; i < len; i++) {
      if (i % 3 === 0 && i > 0) {
         result = "," + result;
      }
      result = digits.charAt(len - i - 1) + result;
   }
   return result;
}
```