UNIVERSITY OF WESTERN ONTARIO

Computer Science 1026b, Spring 2010
Computer Science Fundamentals I
MIDTERM TEST

Solutions

Very Short Answers

Each answer in this section is worth *1 point* for a total of *10 points*.

Question 1

The following questions contain valid Java code and will provide output (without error) if entered into the DrJava interactions pane.

a. Suppose we have defined

```
int n = 4;
double x = 2.5;
```

then the value of the expression `5 * x - n / 5` is: 12.5

b. Suppose we have defined

```
int num1 = 50, num2 = 50;
```

then the value of the expression `(num1 == num2)` is: true

c. After the following code segment is executed

```
int x = 3;
x = x + x;
x = x + x;
```

the value of `x` is: 12

d. After the following code segment is executed

```
int x = 3, y = 5;
x = y;
y = x;
```

the value of `y` is: 5

e. If we declare the array

```
int [] intArr = {2,4,6,8,10};
```

then the value stored in `intArr[1]` is: 4

f. After the following code segment is executed

```
int sum = 0;
int count = 1;
while (count < 5) {
    sum = sum + count;
    count = count + 2;
}
```

the value of `count` is: 5

g. After the following code segment is executed

```
bool x = (true && false) || (true && true) || false;
```

the value of `x` is: true

h. After the following code segment is executed

```
int x = (3+3*2) % 6;
```

the value of `x` is: 3

i. After the following code segment is executed

```
int [] xs = { 1, 2, 3, 4, 5, 6, 7 };
System.out.println(xs[xs.length]);
```

what is printed? (Your solution doesn't need to be precise). OutOfBounds

j. After the following code segment is executed

```
int n = 40;
while ((n % 2) == 0) {
   n = n / 2;
}
```

the value of `n` is: 5

Short Answers

Each solution in this section is worth *4 points* for a total of *20 points*.

Question 2

a. What will be the output of the following code segment?

```
for (int row = 1; row <=3; row ++) {
    for (int count = 1; count <= (4 - row); count++) {
        System.out.print("*");
    }
    System.out.println();
}
```

SOLUTION.
```
***
**
*
```

b. What happens when the following code segment is executed? Why?

```
int sum = 0;
int count = 5;
while (count > 1) {
    sum = sum + count;
    count = count + 2;
}
System.out.println(sum);
```

SOLUTION. This will cause an infinite loop. The value of `count`, starting at five, is *increased* at every iteration. Thus count will *always* be greater than one and the loop will neve terminate as a result of this.

c. In the space provided, write a `for` loop that is equivalent to the following `while` loop. More precisely, after executing this for loop the value in `sum` will be the same as it is after executing the `while` loop below.

```
int sum = 0;
int i = 3;
while (i < 100) {
    sum = sum + i;
    i = i + 3;
}
```

SOLUTION.

```
int sum = 0, i;

for (i=3; i<100; i=i+3) {
    sum = sum + i;
}
```

d. Suppose `Yertle` and `Franklin` are two Turtle objects in the same World. Provide a code segment that makes the two turtles face each other.

SOLUTION.

```
Yertle.turnToFace(Franklin);
Franklin.turnToFace(Yertle);
```

e. Write a code segment that creates a 400px by 300px (width by height) Picture object with all pixels set to red. Assume that this code will be part of a `main` program and *not* in the Picture class. For the red color, use `Color.RED` from the class `java.awt.Color`.

SOLUTION.

```
Picture MyPic = new Picture(400, 300);
Pixel[] PixelArray = MyPic.getPixels();

for (int i=0; i<PixelArray.length; i++) {
   PixelArray[i].setColor( java.awt.Color.RED );
}
```

Long Answers

Each solution in this section is worth *10 points* for a total of *20 points*.

Question 3

a. Write an algorithm in pseudo-code (i.e. code mixed with English) which prints the following pattern when given `n`. Your method should work for any value of n and not only on the examples given below. Note that for a given `n`, the printed pattern has `n+1` rows and `n` columns.

$n = 2$	$n = 3$	$n = 4$
xx	xxx	xxxx
xo	xxo	xxxo
oo	xoo	xxoo
	ooo	xooo
		oooo

Solution

for i from 0 to n do
....print $n - i$ many `x`'s
....print i many `o`'s
....print a new line
end do

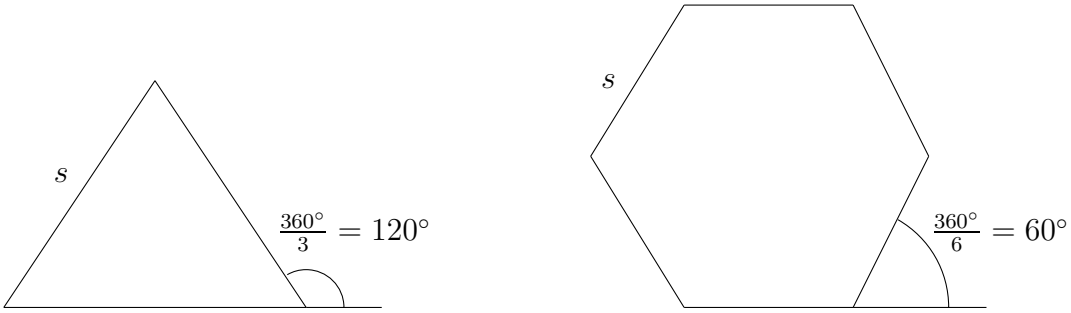
b. Write a java class method `static void PrintPattern (int n)` that prints the same pattern as in Part a.

Solution

```
public static void PrintPattern (int n) {
    for (int i=0; i<=n; i++) {
        for (int j=0; j<n-i; j++) {
            System.out.print("x");
        }
        for (int j=0; j<i; j++) {
            System.out.print("o");
        }
        System.out.println();
    }
}
```

Question 4

Write a java object method `void nSidedPolygon (int n, int s)` for inclusion in the Turtle class that takes as input n and s and draws an n-sided polygon with side length s. You may assume that drawing these polygons will never cause your turtle to go out of its world boundaries. The "exterior angle" will be $360°/n$ as illustrated for $n = 3$ and $n = 6$ in the figure below.



SOLUTION.

```
public void nSidedPolygon (int n, int s) {
    for (int i=0; i<n; i++) {
        this.forward(s);
        this.turn(360 / n);
    }
}
```