

CS 312 – Exam 1 – Fall 2016

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Problem Number	Topic	Points Possible	Points Off
1	Expressions	18	
2	Code Tracing	18	
3	Method Trace	14	
4	Programming	5	
5	Programming	12	
6	Programming	13	
7	Graphics	20	
TOTAL POINTS OFF:			
SCORE OUT OF 100:			

Instructions:

1. Please turn off your cell phones.
2. There are 7 questions on this test.
3. You have 2 hours to complete the test.
4. Place your final answers on this test, not scratch paper.
5. You may not use a calculator.
6. When code is required, write Java code. You may use only features that we discussed up to topics 1-12, including those covered in the textbook for that material (Chapters 1-4).
7. Style is not evaluated when grading. You may add more methods if you wish.
8. The proctors will not answer questions. If you believe a question has an error or is ambiguous, state your assumption and answer based on your assumption.
9. If you finish early bring your exam and scratch paper to the proctor and show them your UTID.

1. Expressions: 1 point each, 18 points total. For each Java expression in the left hand column, indicate the result of the expression in the right hand column.

You must show a value of the appropriate type. For example, 7.0 rather than 7 for a double and "7" instead of 7 for a String. Answers that do not indicate the data type correctly are wrong.

A. $2 + 20 / 5 - 3 * 4 / 2$ _____

B. $15 / 10 + 20 / 30 + 3 / 2$ _____

C. $15 \% 5 + 23 \% 10 + 18 \% 12$ _____

D. $5.0 / 2.0 + 10.0 / 4.0$ _____

E. $4 + 3 / (1.0 * 2) / 0.5$ _____

F. $9 / 2.0 + 7 / 3 - 3.0 / 2$ _____

G. $9 + 5 * -3 + 4 + "X" + 4 + 2$ _____

H. $"3" + 21 \% 20 + 2 \% 42$ _____

I. $9 \% 5 * 6 + 18 / 6 - 1$ _____

J. $15 / 20 + 20 / 15 + 8 / 10$ _____

K. $3 * 5 + 2 + "!!" + 2 * 3 + 1$ _____

L. $(\text{int}) (.75 * 10)$ _____

M. $((\text{int}) .999) * 10 + 2.5$ _____

N. $"2 * 3 " + 2 * 3 + 2$ _____

O. $177 \% 100 \% 10 / 2$ _____

The Math methods floor, pow, and abs all return doubles.

P. $\text{Math.pow}(2.0, 4.0)$ _____

Q. $\text{Math.abs}(-3.33 * -10.0)$ _____

R. $\text{Math.floor}(-1.3 * 3)$ _____

2. Code tracing: 2 points each, 18 points total. Place your answer in the box to the right of the code. If the code results in a syntax error, answer **syntax error**. If the code results in a runtime error, answer **runtime error**.

A. What is output by the following code when it is run?

```
int x1 = 3;
int y1 = x1 * 2 + 3 * x1;
x1 = -1 + x1;
y1++;
System.out.print(x1 + " " + y1);
```

B. What is output by the following code when it is run?

```
String st2 = "dog";
int x2 = 3;
st2 = x2 + st2 + x2 * 2;
x2 += 3;
st2 = "wag" + st2;
System.out.print(st2 + " " + x2);
```

C. What is output by the following code when it is run?

```
double a3 = 2.5;
int x3 = 2;
a3 = 5 / x3 + 3 / x3;
x3 = (x3 + 1) * x3 * x3;
System.out.print(a3 + " " + x3);
```

D. What is output by the following code when it is run?

```
double a4 = 3;
int x4 = 2;
a4 = a4 / x4;
x4 *= 2 + 3;
System.out.print(a4 + " " + x4);
```

E. What is output by the following code when it is run?

```
int x5 = 12;
int y5 = x5 % 6;
x5 = x5 * y5 + x5 / y5;
y5--;
System.out.print(x5 + " " + y5);
```

F. What is output by the following code when it is run?

```
int total = 0;
for (int i = 0; i <= 4; i++) {
    for (int j = i; j >= 0; j--) {
        total = total + i;
    }
}
System.out.print(total);
```

G. How many asterisks does the following code print out?

Don't show the output. Simply state the number of asterisks that are printed out when the code runs.

```
for(int i = -2; i <= 13; i++) {
    System.out.print("*");
}
```

H. How many asterisks does the following code print out?

Don't show the output. Simply state the number of asterisks that are printed out when the code runs.

```
for (int i = 0; i < 5; i++) {
    System.out.print("*");
    for (int j = 0; j < 10; j++) {
        System.out.print("*");
        System.out.print("***");
        System.out.print("***");
    }
    System.out.print("***");
}
```

I. How many asterisks does the following code print out?

Don't show the output. Simply state the number of asterisks that are printed out when the code runs.

```
for(int i = 1; i <= 10; i++) {
    for(int j = 0; j < 5; j++) {
        System.out.print("*");
    }
    System.out.print("*");
    for(int j = 0; j < 10; j++) {
        for (int k = 0; k < 5; k++) {
            System.out.print("*");
        }
    }
}
```

3. Method Tracing and Parameters Simulation: 2 points each, 14 points total.

For each part write what the output to the screen will be when the code is run.

A. What is output by the following code?

```
int x1 = -3;
int y1 = x1 * 3;
ma(x1, y1);
System.out.print(x1 + " " + y1);

public static void ma(int x1, int y1) {
    x1 += 3;
    y1--;
    System.out.print(x1 + " " + y1);
}
```

B. Given the methods above, what is output by the following code?

This question uses method `ma` from part A.

```
int x2 = 3;
int y2 = 2;
ma(y2 * 2, x2 + y2);
System.out.print(x2 + " " + y2);
```

C. What is output by the following code?

```
double a3 = 3.5;
int x3 = 5;
double b3 = x3 / 2.5;
mc(x3, a3, b3);
System.out.print(a3 + b3 + " " + x3);

public static void mc(double a, double b, double c) {
    a = b + 2 + a;
    c++;
    System.out.print(a + b + c);
}
```

D. What is output by the following code?

```
int x4 = 3;
int y4 = md(x4);
int z4 = md(x4) + md(y4);
y4 *= 2 + x4;
System.out.print(x4 + " " + y4 + " " + z4);

public static int md(int x4) {
    double a = x4 / 2.0;
    int y = x4 * 2;
    int z = (int) (a * 3.0);
    return y + z;
}
```

E. What is output by the following code?

```
int x5 = 2;
int y5 = 3;
me1(x5, y5);

public static void me1(int x, int y) {
    x *= me2(x, y);
    y += x + me2(y, y);
    System.out.print(x + " " + y);
}

public static int me2(int x, int y) {
    x--;
    y--;
    System.out.print(x + y);
    return x * y;
}
```

F. What is output by the following code?

```
int t6 = 728239;
int x6 = 0;
for (int i = 1; i <= 4; i++) {
    x6 += mf(t6, i);
}
System.out.print(x6);

public static int mf(int y, int m) {
    for (int i = 0; i < m; i++) {
        y /= 10;
    }
    return y % 10;
}
```

G. What is output by the following code?



```
int x7 = 3;
int y7 = 10;
int z7 = 5;
System.out.print(mg(x7 * z7, y7) + " " + y7 + " " + mg(y7, y7));

public static int mg(int x, int y) {
    x *= 2;
    y = y / 2 + x;
    System.out.print(x + y);
    return y;
}
```

4. Programming: 5 points - Write a Java method `simpleGPA` that calculates and **returns** a simplified Grade Point Average (GPA). The method accepts the number of A's, B's, and C's a student has received. The method returns the simplified GPA which is the average of the grade point's earned per class. The method does not take in the number of D's and F's a student has received. The number of D's and F's are completely ignored in this simplified GPA calculation.

For this method each A is worth 4 grade points, each B is worth 3 grade points, and each C is worth 2 grade points.

Examples:

a method call with 1 A, 0 B's, and 0 C's shall return 4.0

a method call with 1 A, 1 B, and, 0 C's shall return 3.5

a method call with 0 A's, 1 B, and, 1 C shall return 2.5

a method call with 2 A's, 1 B's, and 1 C's shall return 3.25 (13 grade points, 4 classes, average = 3.25)

You may assume there is at least one letter grade.

Complete your `simpleGPA` method, including the method header, below.

5. Programming: 12 points Write a static method named `printPowers` that accepts an integer `value` and an integer `num` as parameters.

The method prints a complete line of output reporting the first `num` powers of `value`.

Consider the following examples:

```
printPowers(8, 2);
```

prints: The first 2 powers of 8 are 8, 64

```
printPowers(10, 6);
```

prints: The first 6 powers of 10 are 10, 100, 1000, 10000, 100000, 1000000

Assume the parameter `num` is ≥ 2 . `value` can be any integer value.

You may **NOT** use any methods from the `Math` class in your answer to this question.

6. Programming: 13 points Complete the method `closerPoint`. The method header is:

```
public static void closerPoint(int x1, int y1, int x2, int y2,  
                               int x3, int y3) {
```

The parameters represent the x, y coordinates of 3 points, Point 1, Point 2, and Point 3.

The method prints out which point (Point 2, Point 3, or both) is closer to Point 1.

Example output:

```
closerPoint(1, 2, 3, 4, 5, 6)
```

Point 2 is closer to Point 1

```
closerPoint(-2, -1, 25, -30, 5, -1)
```

Point 3 is closer to Point 1

```
closerPoint(0, 0, -3, -4, 4, 3)
```

Point 2 and Point 3 are equidistant from Point 1

Recall the distance formula for 2 points given their x and y coordinates:

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

You may use the `Math.pow(double, double)` and `Math.sqrt(double)` methods.

Complete the method `closerPoint` on the next page:

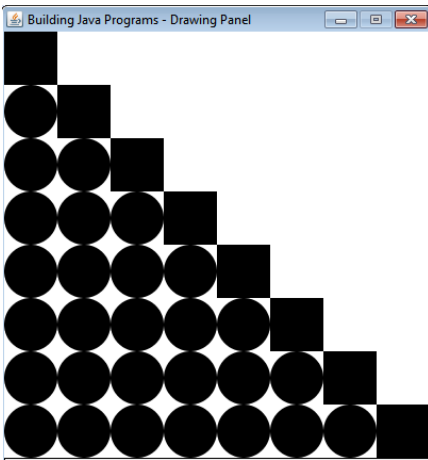
```
public static void closerPoint(int x1, int y1, int x2, int y2,  
                                int x3, int y3) {
```

7. Graphics Programming: 20 points Complete a method to produce the following output.

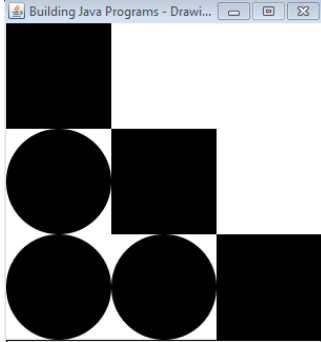
The parameters for the method are:

- The `Graphics` object for the `DrawingPanel`. Color has already been set to `BLACK`
- The size of the `DrawingPanel`. The `DrawingPanel` is square with width and height both equal to `size`. The drawing panel has already been created.
- The number of steps to draw in the "staircase". You may assume `numSteps` divides evenly into `size`.

Here is the output of the method call `drawStaircase(g, 400, 8);`



Here is the output of the method call `drawStaircase(g, 300, 3);`



Recall the following methods from the `Graphics` class:

`fillRect(int x, int y, int width, int height)`

`fillOval(int x, int y, int width, int height)`

Complete the method on the next page.

```
public static void drawStaircase(Graphics g, int size, int numSteps) {
```