### AP CS Recursion Assignment Part 1

### Recursion Questions

1. What is recursion? How does a recursive method differ from a standard iterative method?

A recursive method is a method that calls itself to find solutions to a problem.

1. What are base cases and recursive cases? Why does a recursive method need to have both?

Base cases are the condition to stop recurring. Recursive cases are cases where the recursion continues. Both are needed for recursion to occur.

1. What is a call stack, and how does it relate to recursion?

A call stack is a trace of what method called what other method, it allows for recursion to call itself.

### Recursive Tracing

1. Consider the following method:

public int mystery(int x, int y) {

if (x % 2 == 1 || y % 2 == 1) {

return 1;

} else {

return 2 \* mystery(x / 2, y / 2);

}

}

For each call below, indicate what value is returned:

Method Call Value Returned

mystery(4, 19) \_\_1\_\_\_\_\_\_\_\_\_\_\_\_

mystery(32, 56) \_\_16\_\_\_\_\_\_\_\_\_\_\_\_

mystery(12, 20) \_\_4\_\_\_\_\_\_\_\_\_\_\_\_

mystery(4, 18) \_2\_\_\_\_\_\_\_\_\_\_\_\_\_

mystery(48, 128) \_16\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Consider the following method:

public int mystery1(int x, int y) {

if (x < y)

return x;

else

return mystery1(x - y, y);

}

For each call below, indicate what value is returned:

Method Call Value Returned

mystery1(6, 13) \_\_\_\_6\_\_\_\_\_\_\_\_\_\_

mystery1(14, 10) \_\_\_\_4\_\_\_\_\_\_\_\_\_\_\_

mystery1(37, 10) \_\_\_7\_\_\_\_\_\_\_\_\_\_\_\_

mystery1(8, 2) \_\_0\_\_\_\_\_\_\_\_\_\_\_\_\_

mystery1(50, 7) \_\_\_1\_\_\_\_\_\_\_\_\_\_\_\_

3. Consider the following method:

public void mystery2(int n) {

if (n <= 1)

System.out.print(n);

else {

mystery2(n / 2);

System.out.print(", " + n);

}

}

For each call below, indicate what output is produced by the method:

Method Call Output Produced

mystery2(1) \_\_1\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

mystery2(4) \_\_1, 2, 4\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

mystery2(16) \_\_1, 2, 4, 8, 16\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

mystery2(30) \_\_1, 3, 7, 15, 30\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

mystery2(100) \_\_1, 3, 6, 12, 25, 50, 100\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_