**44-542 Object Oriented Programming**

**Recursion**

**Objective** This worksheet will give you practice in working with recursive methods.

Trace the code and write it below each question for following methods.

**Example:**

Factorial may be defined recursively:

**fact(n) = n \* fact(n - 1) if n > 0;**

**fact(0) = 1**

Using this definition

**fact(2) = 2 \* fact(1) = 2 \* (1 \* fact(0)) = 2 \* (1 \* 1) =**

**2 \* 1 = 2**

Similarly, find the value returned by each of the following methods and show each step in the space provided.

**public static int mystery(int numIn) {**

**if (numIn == 0) {**

**return 0;**

**} else {**

**if ((numIn % 2) == 0) {**

**return (numIn % 10) + mystery(numIn / 10) \* 10;**

**} else {**

**return mystery(numIn / 10);**

**}**

**}**

**}**

* 1. **mystery(8342)**

|  |
| --- |
| 2+(mystery(834)\*10)  2+(4+mystery(83)\*10)\*10  2+(4+(mystery(8))\*10)\*10  2+(4+(8+mystery(0)\*10)\*10)\*10  2+(4+(8+0\*10)\*10)\*10  2+(4+(8)\*10)\*10  2+(84)\*10  840+2  842 |

* 1. **mystery(1357)**

|  |
| --- |
| Mystery(135)  Mystery(13)  Mystery(1)  Mystery(0)  0 |

**public static int mystery(int numIn) {**

**if (numIn == 0) {**

**return 0;**

**} else {**

**if ((numIn % 2) == 0) {**

**return mystery(numIn / 10);**

**} else {**

**return numIn % 10 + mystery(numIn / 10);**

**}**

**}**

**}**

* 1. **mystery(8342)**

|  |
| --- |
| Mystery(834)  Mystery(83)  3+(Mystery(8))  3+(mystery(0))  3+0  3 |

* 1. **mystery(1357)**

|  |
| --- |
| 7+mystery(135)  7+(5+(mystery(13)))  7+(5+(3+mystery(1)))  7+(5+(3+1+mystery(0)))  7+5+3+1+0  16 |



**public class RecursionExercise {**

**public static void main(String[] args){**

**System.out.println(mystery("Hello"));**

**System.out.println(**

**mystery("Thanks Giving Break is soon!"));**

**}**

**public static String mystery(String str) {**

**if (!str.contains(" ")) {**

**return rw(str);**

**} else {**

**return mystery(str.substring(str.indexOf(" ") + 1))**

**+ " " + rw(str.substring(0, str.indexOf(" ")));**

**}**

**}**

**public static String rw(String str) {**

**String rStr = "";**

**for (int i = str.length() - 1; i >= 0; i--) {**

**rStr += str.charAt(i);**

**}**

**return rStr;**

**}**

**}’**

|  |
| --- |
| Mystery(String Hello)  If(!str.contains(“ ”)) ---- if(!false) so true  rw(String Hello)  i=4  rstr = o  i=3  rstr = 0l  i=2  rstr = oll  i=1  rstr = olle  i= 0  rstr = olleh  returns olleh  mystery(String Thanks Giving Break is soon!)  mystery(str.substring(6+1)+” ”+rw(str.substring(0,6));  mystery(String Giving Break is soon!)+” ”+rw(String Thanks);  mystery(str.substring(7))+” ”+rw(str.substring(0,6))+” ”+sknahT  mystery(String Break is soon!)+” ”+rw(String Giving)+” ”+sknahT  mystery(str.substring(6))+” ”+rw(str.substring(0,5))+” ”+gniviG+” ”+sknahT  mystery(String is soon!)+” ”+rw(String Break)+” ”+gniviG+” ”+sknahT  mystery(str.substring(4))+” ”+rw(str.substring(0,3))+” ”+kaerB+” ”+gniviG+” ”sknahT  mystery(String soon!)+” ”+rw(is)+” ”+kaerB+” ”+gniviG+” ”+sknahT  rw(String soon!)+” ”+si+” ”+ kaerB+” ”+gniviG+” ”+sknahT  !noos+” ”+si+” ”+ kaerB+” ”+gniviG+” ”+sknahT  Returns !noos is kaerB gniviG sknahT  Final output:  olleH  !noos si kaerB gniviG sknahT |

4)

**public static void main(String[] args) {**

**System.out.println(mystery("Bearcats"));**

**System.out.println(mystery("****Northwest Bearcats Defeat Fort Hays"));**

**}**

**public static String mystery(String str) {**

**if(str.length() == 0)**

**return "";**

**if (!str.contains(" ")) {**

**return str.charAt(0)+" DONE";**

**} else {**

**return str.charAt(0)**

**+ mystery(str.substring(str.indexOf(" ")+1));**

**}**

**}**

|  |
| --- |
| mystery(String Bearcats)  str.charAt(0)+” Done”;  returns B DONE  mystery(String Northwest Bearcats Defeat Fort Hays)  str.charAt(0)+mystery(str.substring(10));  N+mystery(String Bearcats Defeat Fort Hays);  N+B+mystery(str.substring(8));  N+B+mystery(String Defeat Fort Hays);  N+B+D+mystery(str.substring(7));  N+B+D+mystery(String Fort Hays);  N+B+D+F+mystery(str.substring(5));  N+B+D+F+mystery(String Hays);  N+B+D+F+H+ DONE  Returns NBDFH DONE |