

Week 7 Lab Tutorial: Recursive Functions – Suggested Solutions

Lab Questions

```
#include <stdio.h>
/* function prototypes */
int rNumDigits1(int num);
void rNumDigits2(int num, int *result);
int rDigitPos1(int num, int digit);
void rDigitPos2(int num, int digit, int *pos);
int rSquare1(int num);
void rSquare2(int num, int *result);

int main()
{
    int choice;
    int number;
    int digit, result=0;

    do {
        printf("\nPerform the following functions ITERATIVELY:\n");
        printf("1:  rNumDigits1()\n");
        printf("2:  rNumDigits2()\n");
        printf("3:  rDigitPos1()\n");
        printf("4:  rDigitPos2()\n");
        printf("5:  rSquare1()\n");
        printf("6:  rSquare2()\n");
        printf("7:  quit\n");
        printf("Enter your choice: ");
        scanf("%d", &choice);

        switch (choice) {
            case 1:
                printf("Enter the number: \n");
                scanf("%d", &number);
                printf("rNumDigits1(): %d\n", rNumDigits1(number));
                break;
            case 2:
                printf("Enter the number: \n");
                scanf("%d", &number);
                rNumDigits2(number, &result);
                printf("rNumDigits2(): %d\n", result);
                break;
            case 3:
                printf("Enter the number: \n");
                scanf("%d", &number);
                printf("Enter the digit: \n");
                scanf("%d", &digit);
                printf("rDigitPos1(): %d\n", rDigitPos1(number, digit));
                break;
            case 4:
                printf("Enter the number: \n");
                scanf("%d", &number);
                printf("Enter the digit: \n");
                scanf("%d", &digit);
                rDigitPos2(number, digit, &result);
                printf("rDigitPos2(): %d\n", result);
                break;
            case 5:
                printf("Enter the number: \n");
```

```

        scanf("%d", &number);
        printf("rSquare1(): %d\n", rSquare1(number));
        break;
    case 6:
        printf("Enter the number: \n");
        scanf("%d", &number);
        rSquare2(number, &result);
        printf("rSquare2(): %d\n", result);
        break;
    default: printf("Program terminating ..... \n");
            break;
    }
} while (choice < 7);
return 0;
}
/* Question Q1 */
int rNumDigits1(int num)
{
    if (num < 10)
        return 1;
    else
        return rNumDigits1(num/10) + 1;
}
void rNumDigits2(int num, int *result)
{
    if (num < 10)
        *result = 1;
    else {
        rNumDigits2(num/10, result);
        *result = *result + 1;
    }
}
/* Question Q2 */
int rDigitPos1(int num, int digit)
{
    int p;

    if (num % 10 == digit)
        return 1;
    else if (num < 10)
        return 0;
    else {
        p = rDigitPos1(num/10, digit);
        if (p > 0)
            return p + 1;
        else
            return 0;
    }
}
void rDigitPos2(int num, int digit, int *pos)
{
    if (num % 10 == digit)
        *pos = 1;
    else if (num < 10)
        *pos = 0;
    else {
        rDigitPos2(num/10, digit, pos);
        if (*pos > 0)
            *pos += 1;
        else
            *pos = 0;
    }
}

```

```

    }
}
/* Question Q3 */
int rSquare1(int num)
{
    int result=1;

    if (num == 1)
        return result;
    else
        return rSquare1(num-1) + (2*num -1);
}
void rSquare2(int num, int *result)
{
    if (num == 1)
        *result = 1;
    else {
        rSquare2(num-1, result);
        *result += (2*num -1);
    }
}

```

Q4

If we execute the program and input to the program “ward ” then the output will be “draw”:

Program Output

Enter your word and end it with a space => ward

draw

\$

Please note that there is a blank character at the end of the input word before the “enter” key is pressed. Basically, this program prints an input string, which ends with a space character, in the reversed order. (tutors: please explain why)