Homework 6 Solutions

Exam date: Thursday, November 12.

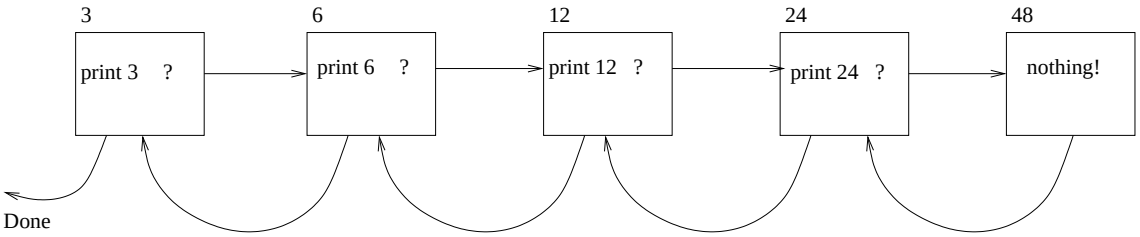
1. Consider the following recursive function (algorithm):

```
thing (n)
   if n < 37 then
      print n
      thing (n * 2)
```

   (a) What is the exact output of the function if the initial value of n is 7?

   7
   14
   28

   (b) Show a "box trace" of the function if the initial value of n is 3.



   Because the work (`print`) is done **before** the recursive call, the output is:

   3
   6
   12
   24

2. Here is another lovely recursive function:

```
lovely (n)
   if n = 1 then
      return 1
   else if n > 1 then
      return n * lovely (n / 2)   <- use integer division
   else
      return -1
```

(a) What does the function return if the initial $n = 2$?

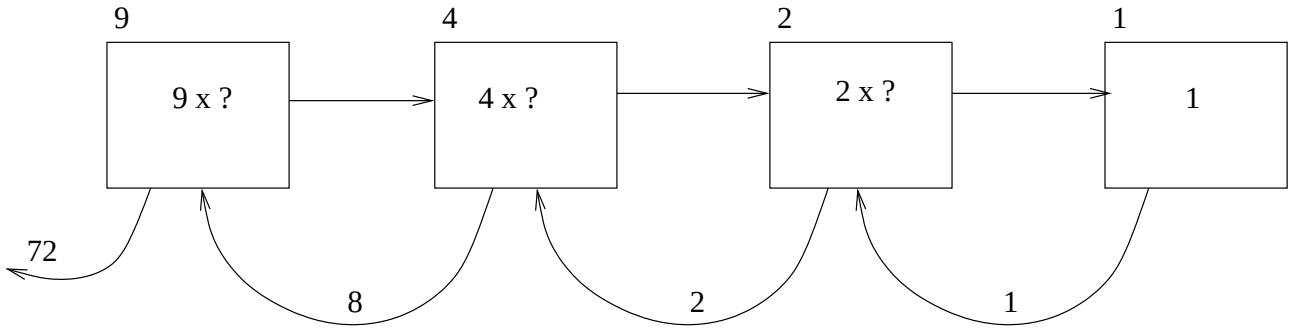
2

(b) What does the function return if the initial $n = -5$?

-1

(c) What does the function return if the initial $n = 9$? Show how you found the result with a box trace.

72



3. Consider the following recursive definition:

$$\text{spock}(n,k) = \begin{cases} 1 & \text{if } n = k \\ 1 & \text{if } k = 0 \\ \text{return spock}(n-1,k-1) + \text{spock}(n-1,k) & \text{otherwise} \end{cases}$$

Write a recursive function in pseudocode for the above definition.

```
spock (n, k)
   if n = k then
      return 1
   else if k = 0 then
      return 1
   else
      return spock(n-1, k-1) + spock(n-1, k)
```