**Question 1**

Code:

(defun PAD (n)

(cond ((= n 0) 1)

((= n 1) 1)

((= n 2) 1)

(t (+ (PAD (- n 2)) (PAD (- n 3))))

)

)

Result for testing PAD with 0-12:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Input | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Output | 1 | 1 | 1 | 2 | 2 | 3 | 4 | 5 | 7 | 9 | 12 | 16 | 21 |

Screenshot for testing:

图片包含 游戏机, 电脑

描述已自动生成

Testing with large numbers:

I first tested it with (PAD 50), and it quickly returns the answer. But when I typed (PAD 100), the program got stuck. There reason is that the recursion ends up with too many layers and there is not enough memory and space for running the program.

**Question 2**

Code:

(defun SUMS (N)

(cond ((= N 0) 0)

((= N 1) 0)

((= N 2) 0)

(t (+ (SUMS (- n 2)) (+ (SUMS (- n 3)) 1)))

)

)

Result for testing SUMS with 0-12:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Input | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Output | 0 | 0 | 0 | 1 | 1 | 2 | 3 | 4 | 6 | 8 | 11 | 15 | 20 |

Screenshot for testing:

图片包含 游戏机, 电脑

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I find out that (PAD n) = (SUMS n) + 1.

Since (PAD n) = (PAD n-2) + (PAD n-3), and (PAD 0) = (PAD 1) = (PAD 2) = 1,

and (SUMS n) = (SUMS n-2) + (SUMS n-3) + 1, and (SUMS 0) = (SUMS 1) = (SUMS 2) = 0,

We subtract these two equations, we have

(PAD n) - (SUMS n) = (PAD n-2) - (SUMS n-2) + (PAD n-3) - (SUMS n-3) -1,

Down to the base case, we have (PAD 0) - (SUMS 0) = 1, (PAD 1) - (SUMS 1) = 1, (PAD 2) - (SUMS 2) = 1.

By induction, we have (PAD n) - (SUMS n) = 1.

So (PAD n) = (SUMS n) + 1.

**Question 3**

Code:

(defun ANON (TREE)

(cond ((not TREE) nil)

((atom TREE) (append '?))

(t (cons (ANON (car TREE)) (ANON (cdr TREE))))

)

)

Screenshot for testing:

手机屏幕的截图

描述已自动生成