1. Give **three** properties of a recursive algorithm. [3]

2. A recursive routine is shown below:

function calc (n)

if n > 0 then

n = n + calc (n - 1)

endif

return n

endfunction

(a) State the purpose of the routine. [1]

(b) Write pseudocode statements to call the routine with a parameter 5 and print the output. [2]

(c) What will be output? [1]

3. Compare the advantages and disadvantages of iterative and recursive routines. [3]

4. A binary tree is shown below.



The binary tree may be represented using three one-dimensional arrays named **left**, **name**, **right**.

| **Index** | **left** | **name** | **right** |
| --- | --- | --- | --- |
| [0] | 2 | John | 1 |
| [1] | 5 | Peggy | 4 |
| [2] | -1 | Alan | 3 |
| [3] | -1 | Chris | -1 |
| [4] | -1 | Sue | -1 |
| [5] | -1 | Ken | -1 |

The procedure below describes a type of tree traversal that can be carried out on the tree.

procedure traverse (pos)

if left(pos) != -1 then traverse (left(pos))

if right(pos) != -1 then traverse (right (pos))

print name(pos)

endprocedure

Using the table below trace the execution of the program when it is called with traverse(0). [5]

| **pos** | **output** |
| --- | --- |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

[Total 15 marks]