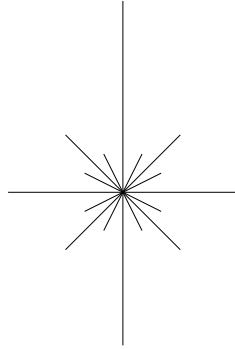


1995 Paper 1 Question 9

Programming in Modula-3

A Modula-3 program to draw compass roses is needed:



In this example the line pointing North is 5 units long, that pointing South is 4 units, East and West 3 units, NE, SE, SW and NW 2 units and NNE, ENE, ESE, SSE, SSW, WSW, WNW and NNW 1 unit. In general if the line pointing North is n units long there will be 2^{n-1} radial lines in the complete rose.

A library routine for drawing lines is provided — its signature is:

```
PROCEDURE Line(angle:REAL; length:CARDINAL)
```

Write two versions of the rose-drawing procedure, one using recursion and one using iteration. In the latter case it may be useful to write an auxiliary procedure that calculates the highest power of two that divides exactly into a given number. The only argument to the top-level rose-drawing procedures should be the length of the North line.

[20 marks]