

## Algorithms – Q1 (20/11/23)

(i) By performing traces, or otherwise, establish what the following algorithm achieves.

10 Input  $N$

20  $e = 0.0001$

30  $L = 1000$

40  $F = 0$

50  $x = \frac{N}{2}$

60  $y = \frac{N}{x}$

70  $z = x$

80  $x = \frac{x+y}{2}$

90 If  $|x - z| < e$  Then Goto 130

100  $F = F + 1$

110 If  $F > L$  Then Goto 140

120 Goto 60

130 Print  $x$

140 Print "End"

150 END

(ii) What roles do  $e$ ,  $F$  and  $L$  play in the algorithm?

## Solution

(i) The algorithm finds the square root of  $N$ .

(ii)  $\epsilon$  determines when the successive estimates are close enough together

$F$  counts the number of iterations

$L$  is the limit imposed on the number of iterations

[Note that  $\epsilon$  and  $L$  are 'hard-coded', to avoid having too many inputs, but that their values are stored at the start of the program, so that changes can easily be made.]