

Algorithms - Exercises (3 pages; 7/4/20)**Key to difficulty:**

* easier

** moderate

*** harder

(1**)(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 130100 $F = F + 1$ 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?

(2**) Use the Bubble Sort algorithm to sort the following items into increasing order.

7 45 13 27 6 19 44 15 21

(3**) Use the Quick Sort algorithm to sort the following items into increasing order.

7 45 13 27 6 19 44 15 21

(4**) A library needs to store away some of its books (to make way for more computers). Each of the storage boxes can contain 100 books. The shelves to be stored have the following contents, and each shelf has to be stored in a single box.

Photography: 7 books

Fiction: 45 books

Pastimes: 13 books

History: 27 books

Art: 6 books

Computers: 19 books

Biographies: 44 books

Self-help: 15 books

Science : 21 books

(i) Apply the First-fit algorithm.

- (ii) Apply the First-fit Decreasing algorithm.
- (iii) Apply the Full bins method.