Section 2.1

1 Describe an algorithm that determines the location of the first even integer in a list $a_1, a_2, \ldots, a_n$ of integers. (If no integer in the list is even, the output should be that the location is 0.)

Solution

location := 0
for $i := 1$ **to** n
if a_i **mod** $2 = 0$ **then** *location* := i

2. Describe an algorithm that takes as input a positive integer n and gives as output the tens' digit of n.

Solution

$t := n - 100 \left\lfloor \frac{n}{100} \right\rfloor$ { t is the number consisting of the tens' and units' digits of n }
$u := t - 10 \left\lfloor \frac{t}{10} \right\rfloor$ { u is the units' digit of t }
answer := $t - u$.

3. Describe an algorithm that takes as input a sequence of distinct integers $a_1, a_2, \ldots, a_n$ ($n \geq 2$) and determines if the integers are in increasing order.

Solution

output := TRUE
for $i := 2$ **to** n
if $a_{i-1} \geq a_i$ then *output* := FALSE

4. Describe an algorithm that takes as input a list of integers $a_1, a_2, \ldots, a_n$ (where $n > 2$) and determines if some a_i is equal to the average of an earlier entry in the list and a later entry in the list.

Solution

answer := FALSE
$i := 2$
while *answer* = FALSE **and** $i < n$ **do**
begin
$j := 1$
while $j < i$ **and** *answer* = FALSE { examine earlier entries in the list }
begin
$k := i + 1$
while $k \leq n$ **and** *answer* = FALSE { examine later entries in the list }
if $a_i = \dfrac{a_j + a_k}{2}$ **then** *answer* := TRUE
end
end