



AS COMPUTER SCIENCE

Paper 1

June 2017

7516/1/PM

Preliminary Material

To be opened and issued to candidates on or after 1 March 2017 subject to the instructions given in the Teachers' Notes (7516/1/TN).

NOTE

- **The PRELIMINARY MATERIAL, SKELETON PROGRAM and DATA FILE are to be seen by candidates and their teachers ONLY, for use during preparation for the examination on MONDAY 5 JUNE 2017. It CANNOT be used by anyone else for any other purpose, other than that stated in the instructions issued, until after the examination date has passed. It must NOT be provided to third parties.**

[Turn over]

INFORMATION

- **A Skeleton Program is provided separately by your teacher and must be read in conjunction with this Preliminary Material.**
- **You are advised to familiarise yourselves with the Preliminary Material and Skeleton Program before the examination.**
- **A copy of this Preliminary Material and the Skeleton Program will be made available to you in hard copy and electronically at the start of the examination.**
- **You must NOT take any copy of the Preliminary Material, Skeleton Program and Data File or any other material into the examination room.**

INSTRUCTIONS FOR CANDIDATES

The question paper is divided into THREE sections and a recommendation is given to candidates as to how long to spend on each section.

Below are the recommended timings for the 2017 examination.

SECTION A

You are advised to spend no more than 20 MINUTES on this section.

You will be asked to create a new program and answer questions NOT related to the PRELIMINARY MATERIAL or SKELETON PROGRAM.

SECTION B

You are advised to spend no more than 20 MINUTES on this section.

Questions will refer to the PRELIMINARY MATERIAL and the SKELETON PROGRAM, but will not require programming.

SECTION C

You are advised to spend no more than 65 MINUTES on this section.

Questions will use the PRELIMINARY MATERIAL and the SKELETON PROGRAM and may require the TestCase.txt DATA FILE.

ELECTRONIC ANSWER DOCUMENT

Answers for ALL questions, for ALL sections, must be entered into the word-processed document made available to you at the start of the examination and referred to in the question paper rubrics as the ELECTRONIC ANSWER DOCUMENT.

PREPARATION FOR THE EXAMINATION

You should ensure that you are familiar with this PRELIMINARY MATERIAL and the SKELETON PROGRAM for your programming language.

[Turn over]

PLANT GROWING SIMULATION

The SKELETON PROGRAM accompanying this PRELIMINARY MATERIAL is a program for the simulation of plants growing.

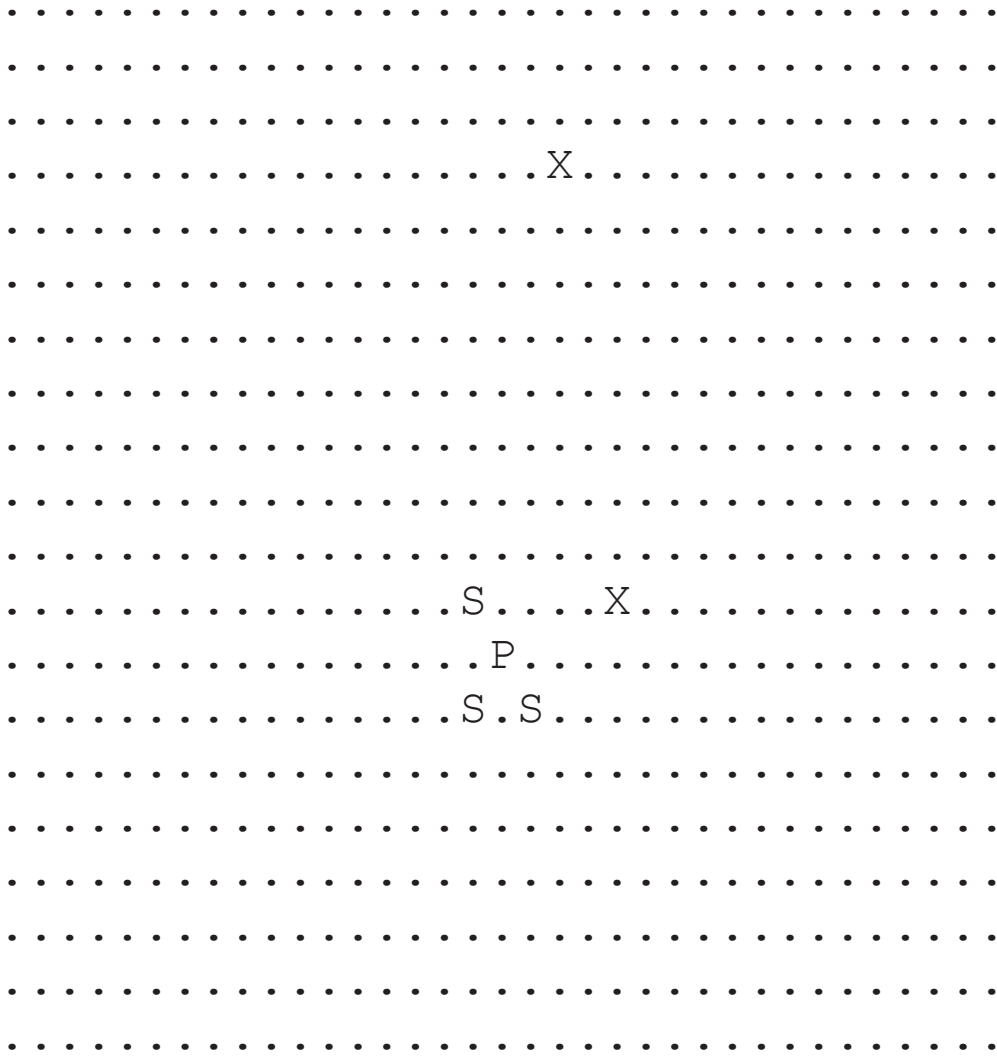
A plant scientist wants to use a computer to simulate how a specific plant will propagate over several years.

The field in which the plant is to grow and propagate is represented as a rectangular grid of cells. A cell can contain just soil, a plant, a seed or rock. It will always contain only one of these.

- If a cell contains just soil, then the cell is represented by ' . '**
- If a cell has a plant growing in it, the cell is represented by ' P '**
- If a cell contains a seed, then the cell is represented by ' S '**
- If a cell contains rock, then the cell is represented by ' X '**

FIGURE 1 is an example of a field model.

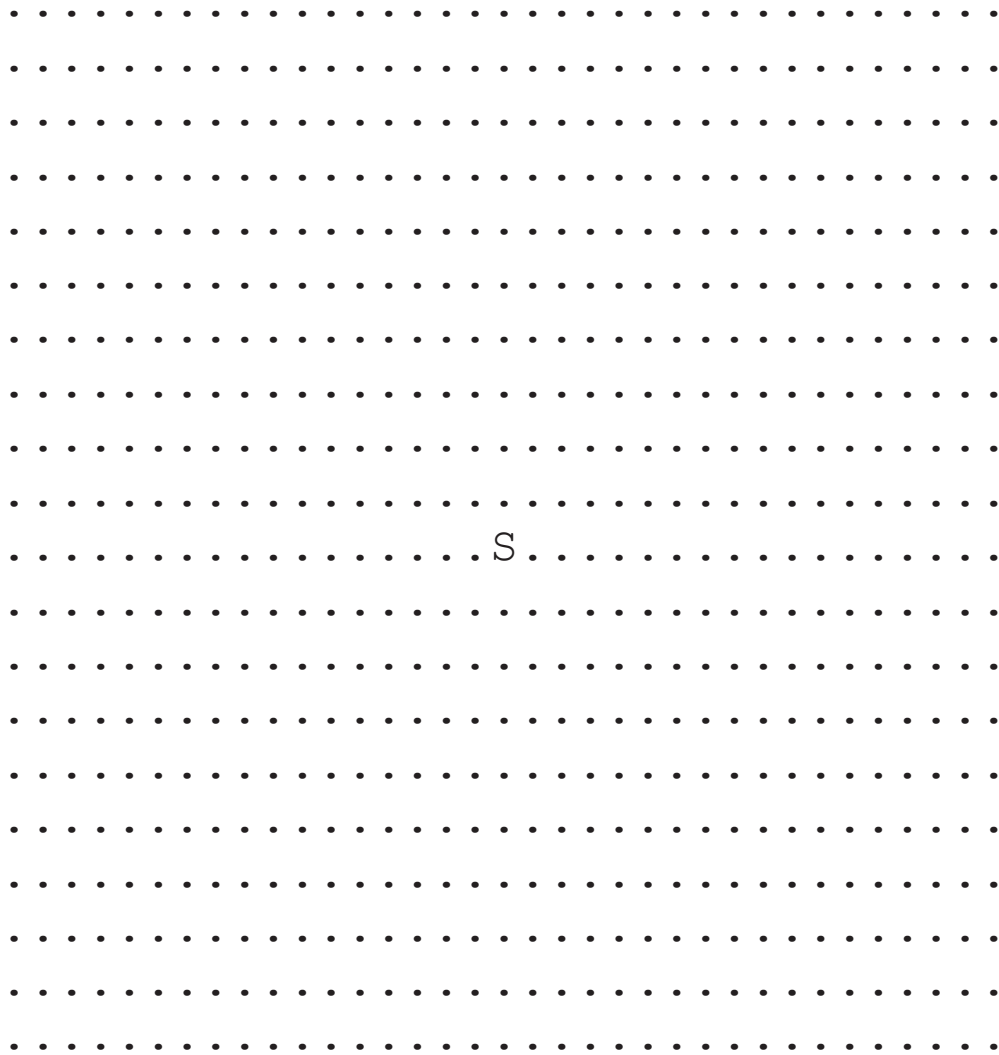
FIGURE 1



[Turn over]

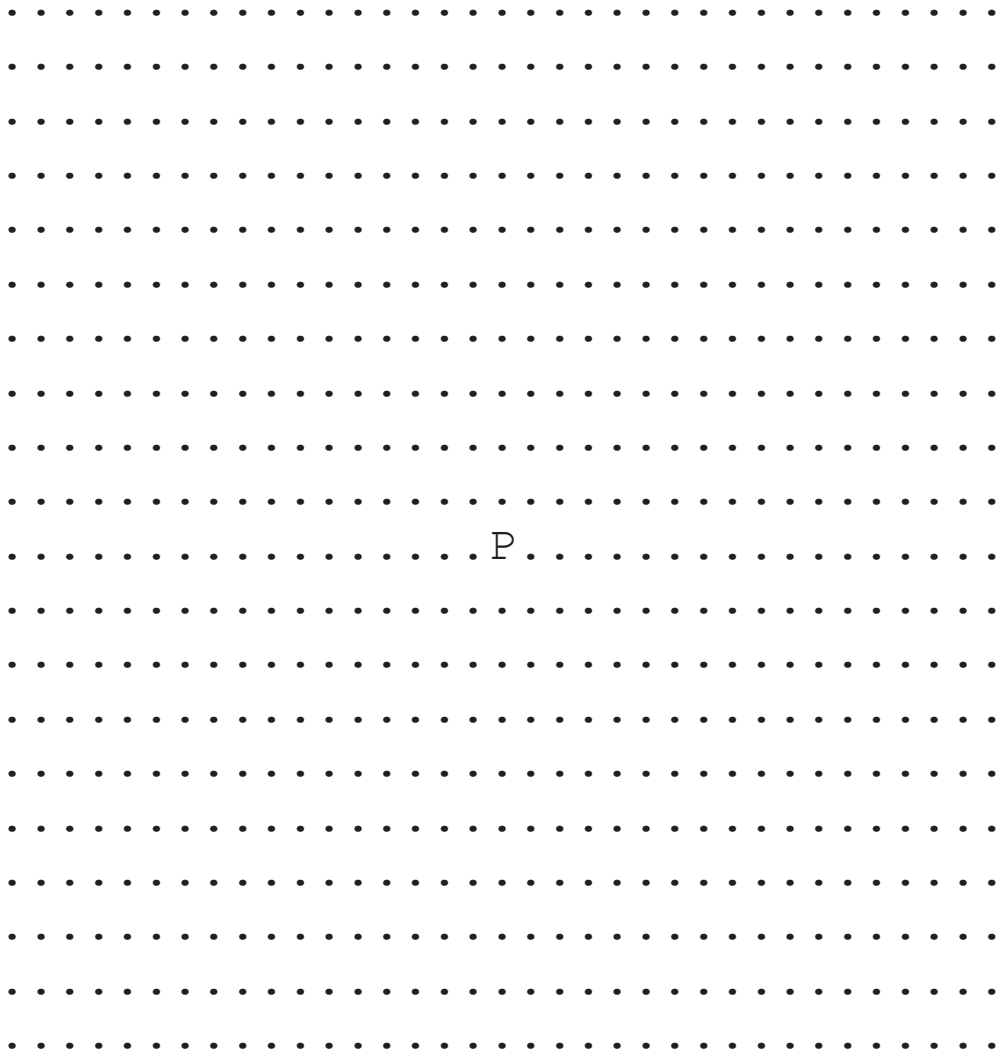
A new field starts with a seed in the middle of the field as shown in FIGURE 2.

FIGURE 2



In the spring the seed germinates into a plant as shown in FIGURE 3.

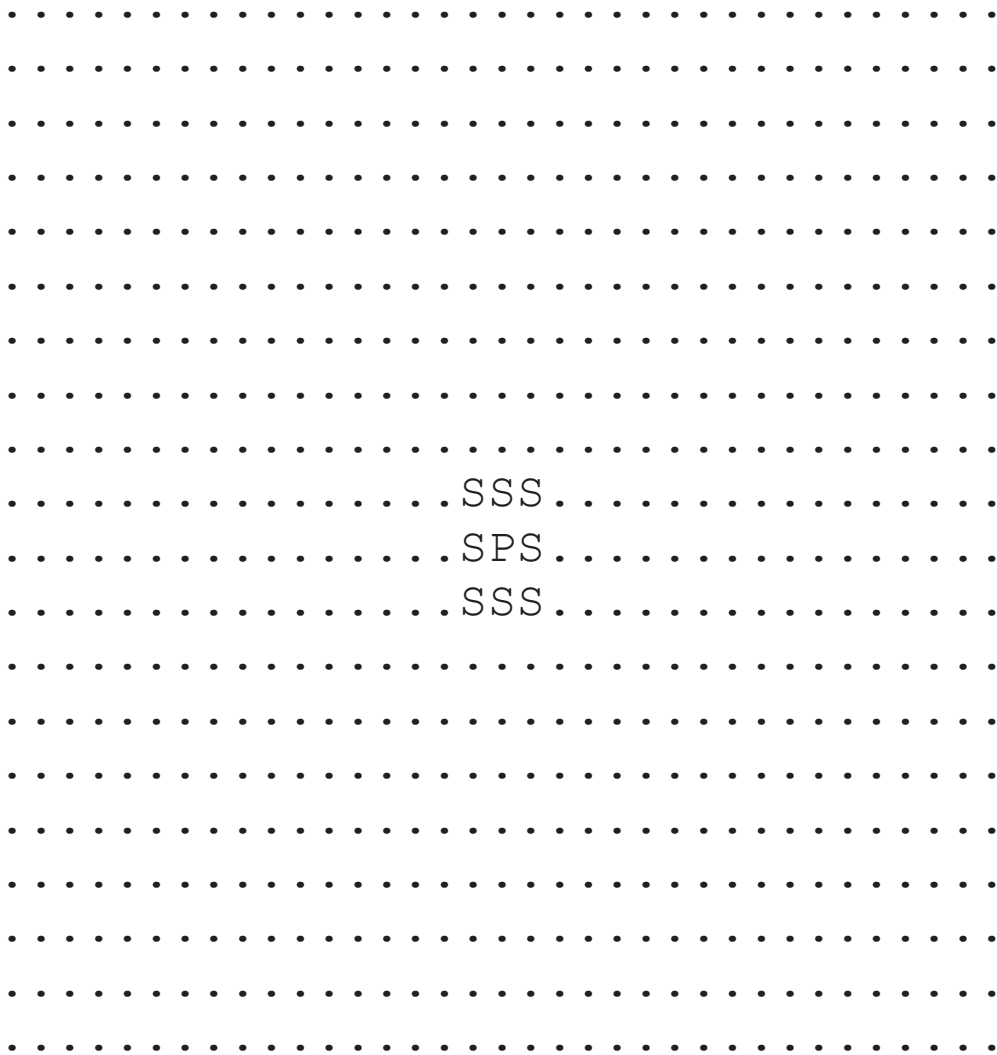
FIGURE 3



[Turn over]

In the autumn the plant drops a seed in each cell immediately around the plant as shown in FIGURE 4.

FIGURE 4



In the winter the plant dies. This is represented by the cell content changing to a ' . ' as shown in FIGURE 5.

FIGURE 5

```

. . . . .
. . . . .
. . . . .
. . . . .
. . . . .
. . . . .
. . . . .
. . . . .
. . . . . S S S .
. . . . . S . S .
. . . . . S S S .
. . . . .
. . . . .
. . . . .
. . . . .
. . . . .
. . . . .
. . . . .
. . . . .

```

[Turn over]

The seeds then lie dormant until spring when the cycle starts again and each seed germinates into a plant. In the spring a random frost may occur and kill off some of the plants. In the summer random rainfall patterns can result in a severe drought which also kills off some of the plants. In the autumn plants drop their seeds.

- If more than one seed lands in (drops into) a cell, only one seed survives.
- If there is a plant where a seed lands, the seed does not survive. The plant remains in the cell.
- If there is rock where a seed lands the seed does not survive. The rock remains in the cell.

At the end of year 2 the field contents may be as shown in FIGURE 6.

FIGURE 6

.
.
.
.
.
.
.
.
. S S S S S .
. S . S . S .
. S S S . S .
. S . S S .
. S S S .
.
.
.
.
.
.
.

[Turn over]

The **SKELETON PROGRAM** can use the **TestCase.txt** **DATA FILE** to start the simulation with a different setup.

FIGURE 7 shows the contents of **TestCase.txt**.

FIGURE 7

```

.....S.....| 0
.....X.....| 1
.....| 2
.....SSSSSSXSSSSSSSSSS.....S.....| 3
.....| 4
.....S.S.....S.S.....| 5
.....S.....S.....| 6
.....S.SSSSSSSSSSXSS.S.....| 7
.....S.S.....S.S.....| 8
..X.....| 9
.....S.S.S.....S.S.S.....| 10
.....S.X.S.SSSSS.S.S.S.....| 11
.....S.S.S.S.....S.S.S.S.....X.....| 12
.....S.S.S.S.S.S.S.S.S.....| 13
.....S.S.S.S.....S.S.S.S.....| 14
.....S.....SSSSS.....S.....| 15
.....S.S.S.....S.S.S.....| 16
.....XX.....S.....| 17
.....S.S.....S.S.....| 18
.....S.....S.....| 19

```

The **SKELETON PROGRAM** allows the user to simulate plant growth and propagation for up to five years. There is also an option to step through the simulation a year at a time.

END OF PRELIMINARY MATERIAL

There are no materials printed on this page

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