4 Design and code a computer program to simulate the following:

A garden has a rectangular fish pond measuring 15 metres by 8 metres.

The pond is to be represented on the screen by a rectangular grid. Each square metre of the pond is represented by an x-coordinate and a y-coordinate. The top left square metre of the pond display has x = 1 and y = 1.

A boy throws a stone into the pond. The user will input the x-coordinate and y-coordinate of the stone impact position.

A grid representing the pond is then displayed with the stone's impact position:

```
X coordinate <1 to 15>? 9
Y coordinate <1 to 8>? 3

...............
...............
........S......
...............
...............
...............
...............
...............
```

Task 4.1
The following are the suggested characters to use for the visual representation of the pond:

Character	ASCII code (decimal)	Represents
.	46	One square metre of water
S	83	Stone impact position

Decide on the design to be used for:

- The data structure to represent the grid
- The contents of each square metre of the pond
- Procedure(s) and/or function(s)s to be used

Evidence 17
Show your program design (Task 4.1). [6]

Task 4.2
Write program code to display the pond contents after a single stone has been thrown.

Evidence 18
The program code. [7]

Evidence 19
Screenshot for a single run of the program. [1]

Task 4.3
The boy has been told to stop throwing stones into the pond because the pond now has three fish. The fish randomly swim around. Each fish will occupy a unique grid position.

Using a random number generator, simulate the positioning of the three fish.

Use the following character for a fish:

Character	ASCII code (decimal)	Represents
F	70	Fish

Write program code to show the pond containing the three fish at a particular instance of time. The program will now only display the pond and fish.

Evidence 20
The program code for Task 4.3. [6]

Evidence 21
Screenshot for a single run of the program. [1]

Task 4.4
The boy has been asked to feed the fish. He cannot see the fish in the pond. He throws a food pellet into the pond which lands inside one of the square metres. If one of the fish is in this square, it eats the food and becomes a happy fish.
Use character symbols for the pond's grid display as follows:

Character	ASCII code (decimal)	Represents
.	46	One square metre of water
P	80	Pellet (if not eaten by one of the fish)
H	72	Happy (fed) fish
F	70	Fish

Write program code to simulate the boy throwing one food pellet into the pond. The user will input an x-coordinate and y-coordinate for the food pellet position. You should consider the possible reuse of any code from Tasks 4.2 and 4.3.

Evidence 22
The program code. [6]

[Turn over

Evidence 23
Screenshot evidence similar to that shown which shows:

- one throw which did not feed a fish

```
X coordinate <1 to 15> ? 2
Y coordinate <1 to 8>? 5

...............
...............
........F......
...............
.P........F....
...............
....F..........
...............
```

- a second throw where a fish was fed

```
X coordinate <1 to 15> ? 1
Y coordinate <1 to 8>? 5

...............
...............
..............F
...............
H..............
...............
.......F.......
...............
```

[3]