

## 1997 Paper 11 Question 2

### Modula-3

The secretary of a health club stores the names, ages and heights of the club's clients in a database and requires a Modula-3 program to sort the clients three ways: into alphabetical order of name, into ascending order of age and into ascending order of height.

An early version of the program contains the following declaration of a variable p:

```
VAR
  p := ClientArray {
    NEW (RefClient, name := "JACK", age := 34, height := 1.70),
    NEW (RefClient, name := "JILL", age := 22, height := 1.76),
    .
    .
    .
  };
```

Provide suitable TYPE declarations for the identifiers `RefClient` and `ClientArray`.  
[4 marks]

The heading of the required sort procedure is:

```
PROCEDURE Sort (VAR p : ARRAY OF RefClient; fges : CompType) =
```

where the type of the formal parameter `fges` is declared as:

```
CompType = PROCEDURE (VAR p : ARRAY OF RefClient;
  i : CARDINAL) : BOOLEAN;
```

The procedure `Sort` may be called in three ways:

```
Sort (p, NameComp);
Sort (p, AgeComp);
Sort (p, HeightComp);
```

which sort the clients by name, age and height respectively.

Write a suitable procedure `AgeComp` which compares the ages of two adjacent clients.  
[4 marks]

Write a suitable body for the procedure `Sort` which uses a simple sort-by-exchange algorithm that uses the procedure argument `fges`.  
[12 marks]