4. A program is being developed to help scientists track and analyse earthquake activity around the world. Data is stored about the latitude, longitude and magnitude of all earthquakes. The latitude and longitude identify the location of an earthquake, and the magnitude indicates the strength of the earthquake.

This data will be stored in a 2-dimensional array of real numbers called `events` as shown below. A total of 14 earthquake events have been recorded.

latitude	longitude	magnitude
34.1	−116.8	0.81
33.3	−116.2	0.86
31.6	−104.0	1.5
31.6	−104.0	1.9
38.8	−122.8	0.51
28.7	128.6	4.6
35.8	−118.6	0.96
61.9	−149.9	2.5
38.8	−122.7	0.75
31.7	−104.1	3.1
38.8	−122.8	0.75
64.5	−147.0	1
33.0	−115.6	1.58
38.8	−122.9	0.78

(a) Using a programming language of your choice, write the code used to declare a 2-dimensional array called `events` to store this data. **1**

(b) The insertion sort algorithm will be used to sort the `events` array in descending order of magnitude.

(i) Using a programming language of your choice, write the code needed to sort the `events` array using the insertion sort algorithm. **4**

(ii) Describe the evidence that should be gathered during testing to demonstrate that the data in the `events` array has been sorted correctly. **2**

4. (continued) **MARKS**

(c) Scientists want to spot local clusters of earthquake activity. An earthquake event is local if both the latitude and longitude are five or less from any other event.

For example, if the data for the earthquake at index 13 below is analysed, there are four other events (at indices 7, 10, 11 and 12) with a difference of five or less for both latitude and longitude.

A 1-dimensional array called `clusterSize` will be populated with the number of earthquakes local to each location.

	events			
index	**latitude**	**longitude**	**magnitude**	**clusterSize**
0	28.7	128.6	4.6	
1	31.7	−104.1	3.1	
2	61.9	−149.9	2.5	
3	31.6	−104.0	1.9	
4	33.0	−115.6	1.58	
5	31.6	−104.0	1.5	
6	64.5	−147.0	1	
7	35.8	−118.6	0.96	
8	33.3	−116.2	0.86	
9	34.1	−116.8	0.81	
10	38.8	−122.9	0.78	
11	38.8	−122.7	0.75	
12	38.8	−122.8	0.75	
13	38.8	−122.8	0.51	4

Using pseudocode, design an algorithm to populate the `clusterSize` array with a count of the number of earthquakes local to each earthquake event. **4**

(d) Once the application is released and has been used successfully for some time, the developers propose rewriting it as an object-oriented programming project with a class for earthquake events and an additional class to hold details of volcanic events.

(i) State the type of maintenance required and justify your answer. **2**

(ii) Explain why both economic and technical feasibility must be considered before implementing the object-oriented version. **2**