Do not write outside the box

Question 4 **(If you answer this question, do not answer Question 3)**

0 4 A student was planning a fieldwork investigation into interception rates in a small drainage basin.

Figure 7 outlines the background to this investigation.

Figure 7

The student's aim was to find out if there were different interception rates in areas with different land use across a small drainage basin. This was part of a wider enquiry into factors affecting run-off rates and flood risk in the local area.

His enquiry question was:

'What is the role of land use in the water cycle at this location?'

The student started by interviewing a local resident who felt that a new housing estate within the drainage basin had contributed to flash flooding events in recent years. The resident wondered whether the removal of woodland had resulted in more water running overland into the river, causing water levels in the river to rise very quickly.

The student did further reading and research. He concluded that land use may affect interception rates. Interception is the process where water is retained in the vegetation canopies. The rate of interception is likely to change with land use. Woodland areas are likely to have higher interception rates after a precipitation event because a proportion of the rainfall is retained. Areas with less vegetation would have lower interception rates. Areas with higher interception rates are likely to have less overland flow because some water will be recycled into the atmosphere through evaporation and some will be infiltrated into the ground.

The student's aim was to discover whether there were different rates of interception across different land uses in the drainage basin.

The student's hypothesis for this investigation was:

'Woodland areas will have the highest rates of interception in this drainage basin.'

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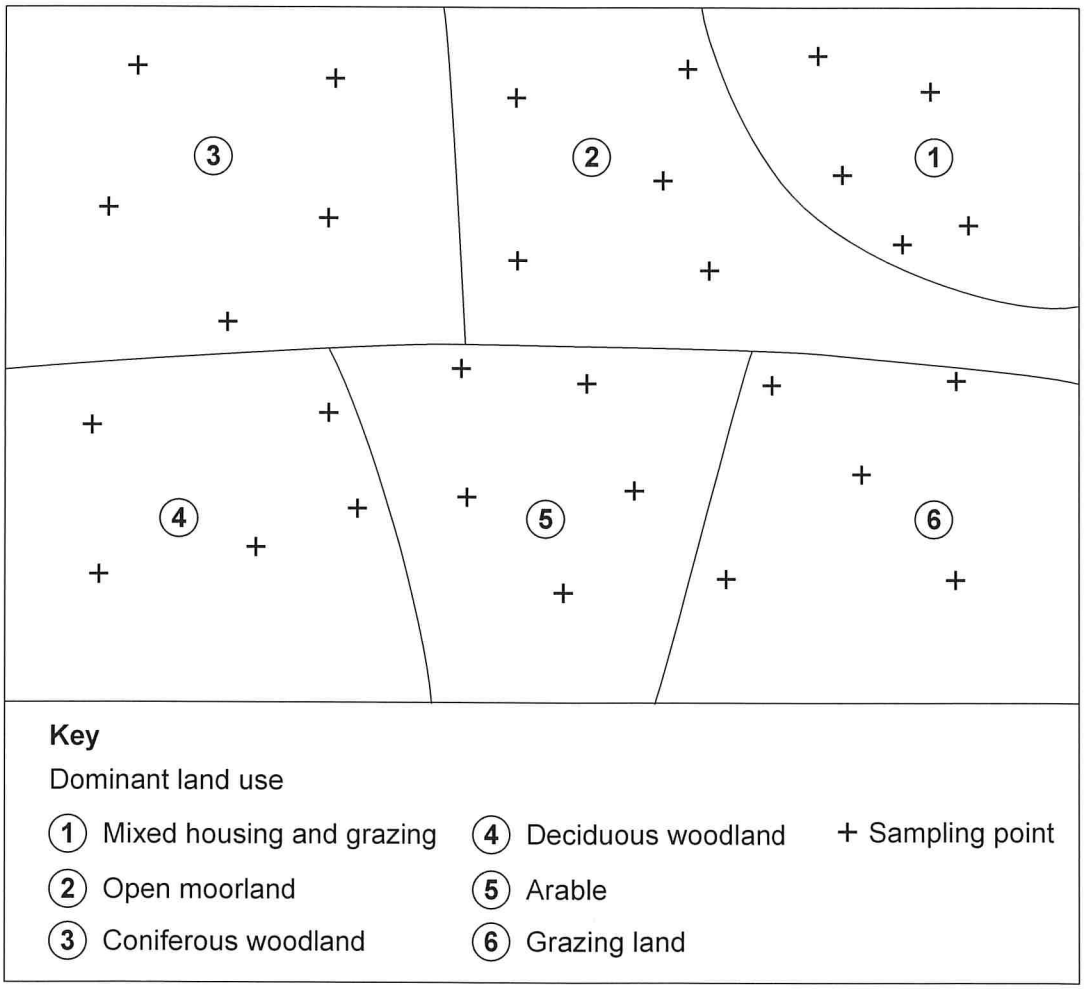
The student used an OS map of the drainage basin to devise a sketch map showing dominant land use in each area of the drainage basin. These are the numbered areas shown in **Figure 8**.

In each of these six areas he used grid references to randomly sample five locations. **Figure 8** shows the land use map and the sampling points.

He then plotted these locations onto a map using GIS. He put the grid references of his sampling points into his smartphone to locate them in the field and accurately record the data.

Figure 8



0 4 . 1 Using **Figure 8**, outline the benefits of this sampling strategy.

[2 marks]

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Figure 9 outlines how the student carried out the investigation.

Figure 9

At each sampling point, the student dug a hole and buried a rain gauge so that about 5 cm was sticking out of the ground. He left the rain gauge in place when rain was forecast. He measured the amount of rain in each gauge each day for three consecutive days. The mean rainfall was then calculated. He recorded and uploaded this data onto the GIS map. He also recorded weather conditions using a secondary data source. In a notebook he recorded general sampling point properties such as local gradient and topography.

In the review of his fieldwork investigation, the student felt confident that his data collection methods had been appropriate and reliable and would require no further development in order to test the hypothesis, but further development would be needed to meet the wider aims and objectives of the enquiry.

0 4 . 2 The student decided to present the data using the isoline map shown in **Figure 10**.

Complete **Figure 10** by adding the 20 and 25 millimetre isolines.

[2 marks]

Figure 10