READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces provided.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO NOT WRITE IN ANY BARCODES.

Write your answer to each question in the space provided.
If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.

Answer all questions.

The Insert contains Figs. 1.1, 1.2 and 1.5 for Question 1, and Tables 2.1, 2.2 and 2.3 for Question 2. The Insert is not required by the Examiner.
Sketch maps and diagrams should be drawn whenever they serve to illustrate an answer.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
Students in South Korea investigated differences in temperatures around their school. They chose 10 sites at which to measure temperature, 5 in a built-up area and 5 in a rural area. The 10 sites are shown on Fig. 1.1 (Insert).

The students investigated the following hypotheses:

**Hypothesis 1:** Temperatures are higher in the built-up area than in the rural area.

**Hypothesis 2:** Daily temperatures differ more in the built-up area than in the rural area.

(a) To measure the temperature the students used a digital thermometer. This is shown in Fig. 1.2 (Insert).

(i) Give three advantages of using a digital thermometer such as the one shown in Fig. 1.2.

1 ..........................................................................................................................................

2 ..........................................................................................................................................

3 ..........................................................................................................................................

............................................................................................................................................. [3]

(ii) Suggest two ways that the students could check that their temperature measurements were correct.

1 ..........................................................................................................................................

2 ..........................................................................................................................................

............................................................................................................................................. [2]
(b) The students measured the temperature in the morning and afternoon at each of the 10 sites. Their results are shown in Table 1.1 below.

Table 1.1
Students’ results

<table>
<thead>
<tr>
<th>Measuring site location</th>
<th>Morning temperature (°C)</th>
<th>Afternoon temperature (°C)</th>
<th>Average temperature (°C)</th>
<th>Difference between morning and afternoon temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sites in built-up area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pathway next to the canteen</td>
<td>19.2</td>
<td>26.8</td>
<td>23.0</td>
<td>7.6</td>
</tr>
<tr>
<td>Centre of the school buildings</td>
<td>18.9</td>
<td>30.3</td>
<td>24.6</td>
<td>11.4</td>
</tr>
<tr>
<td>Driveway leading to the school</td>
<td>22.1</td>
<td>39.8</td>
<td>31.0</td>
<td>17.7</td>
</tr>
<tr>
<td>Artificial grass next to the sports hall</td>
<td>17.8</td>
<td>27.9</td>
<td>22.9</td>
<td>10.1</td>
</tr>
<tr>
<td>Residential area for students</td>
<td>25.2</td>
<td>32.7</td>
<td>29.0</td>
<td>7.5</td>
</tr>
<tr>
<td>Sites in rural area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tea plantation</td>
<td>21.5</td>
<td>22.5</td>
<td>22.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Small open woodland</td>
<td>17.1</td>
<td>18.7</td>
<td>17.9</td>
<td>1.6</td>
</tr>
<tr>
<td>Grassland</td>
<td>16.9</td>
<td>25.6</td>
<td>21.3</td>
<td>8.7</td>
</tr>
<tr>
<td>Large dense woodland</td>
<td>16.4</td>
<td>16.9</td>
<td>16.7</td>
<td>0.5</td>
</tr>
<tr>
<td>Large car park</td>
<td>17.5</td>
<td>38.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(i) Calculate the average temperature and the difference in temperature between morning and afternoon at the large car park. Write your answers in Table 1.1. [2]

(ii) The students decided not to use the results from the car park. Look again at Table 1.1 and Fig. 1.1 and suggest why they made this decision.

...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
........................................................................................................................................... [3]
(iii) Use the results in Table 1.1 to complete Fig. 1.3 below by plotting the average temperatures of the sites in the residential area for students and the large dense woodland. [2]
(iv) What is your conclusion to **Hypothesis 1**: Temperatures are higher in the built-up area than in the rural area? Support your decision with evidence from Fig. 1.3 and Table 1.1. Do not refer to results from the car park in your answer.

...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
........................................................................................................................................... [3]
(c) To investigate **Hypothesis 2: Daily temperatures differ more in the built-up area than in the rural area**, the students studied the results of their morning and afternoon measurements (not including the car park).

(i) Use the results in Table 1.1 to **plot on Fig. 1.4** below the temperatures of the site on artificial grass next to the sports hall. [2]
(ii) Which conclusion to **Hypothesis 2: Daily temperatures differ more in the built-up area than in the rural area** is most accurate? Tick your decision and support your answer with data from Fig. 1.4 and Table 1.1. Do not refer to results from the car park in your answer.

<table>
<thead>
<tr>
<th>Conclusion</th>
<th>Tick (✓)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 2 is completely true.</td>
<td></td>
</tr>
<tr>
<td>Hypothesis 2 is partially true.</td>
<td></td>
</tr>
<tr>
<td>Hypothesis 2 is not true.</td>
<td></td>
</tr>
</tbody>
</table>

...........................................................................................................................................  [3]

(iii) Suggest reasons for the difference in temperatures between built-up and rural areas shown in Fig. 1.4 and Table 1.1.

...........................................................................................................................................  [4]

(d) Explain how and why an increase in the amount of cloud cover might affect daytime temperatures in the area around the school.

...........................................................................................................................................  [2]
(e) Whilst measuring the temperatures at different sites the students realised that wind speed varied. An instrument to measure wind speed is shown in Fig. 1.5 (Insert).

(i) What is the instrument used to measure wind speed called?

........................................................................................................................................... [1]

(ii) Explain how this instrument measures wind speed.

...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
........................................................................................................................................... [3]

[Total: 30]
Students from a popular tourist town in England wanted to find out how tourism affected traffic in the town. They decided to do a traffic survey to investigate this issue. Each student chose different hypotheses to investigate.

One student tested the following hypotheses:

**Hypothesis 1:** Cars are the main category (type) of vehicle in the town throughout the day.

**Hypothesis 2:** The percentage of tourist coaches varies during the day.

(a) To investigate the hypotheses the students did a traffic survey at four sites around the town centre.

The table below shows different features of a reliable traffic survey. **Complete the table** to explain how each feature makes a survey reliable. The first explanation has been done for you.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students must not stand too near the side of the road.</td>
<td>To make sure they are not in danger from traffic</td>
</tr>
<tr>
<td>Counting must start and finish at the same time at all counting sites.</td>
<td></td>
</tr>
<tr>
<td>At each site traffic must be counted moving past in both directions.</td>
<td></td>
</tr>
<tr>
<td>Students need to agree on the different categories in which to count vehicles.</td>
<td></td>
</tr>
<tr>
<td>A tally method is used to count and record vehicles.</td>
<td></td>
</tr>
<tr>
<td>A data recording sheet must be completed at each site.</td>
<td></td>
</tr>
</tbody>
</table>

(b) The students agreed to count the traffic in different parts of the town for 30 minutes at six times during the day. The results of the traffic counts between 08:30 and 09:00 and between 10:30 and 11:00 are shown in Tables 2.1 and 2.2 (Insert).

(i) Which category (type) of vehicle has the same total at both times?

.........................

[1]
(ii) What do the results show about the number of cars counted between 08:30 and 09:00 and between 10:30 and 11:00? Tick (✓) your answer below.

<table>
<thead>
<tr>
<th>The number of cars goes up.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The number of cars is the same.</td>
</tr>
<tr>
<td>The number of cars goes down.</td>
</tr>
</tbody>
</table>

(iii) An example of the students’ recording sheet is shown in Fig. 2.1 below. Use the data in Table 2.3 (Insert) to complete the recording sheet.

```
Recording sheet

<table>
<thead>
<tr>
<th>Site 1:</th>
<th>Time: 12:30 – 13:00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle category</td>
<td>Tally</td>
</tr>
<tr>
<td>Car</td>
<td>🔴🔴🔴🔴</td>
</tr>
<tr>
<td>Local bus/minibus</td>
<td>🔴🔴🔴</td>
</tr>
<tr>
<td>Lorry/van</td>
<td>🔴🔴🔴🔴🔴</td>
</tr>
<tr>
<td>Tourist coach</td>
<td>🔴🔴</td>
</tr>
<tr>
<td>Motorbike</td>
<td></td>
</tr>
<tr>
<td>Taxi</td>
<td></td>
</tr>
<tr>
<td>Bicycle</td>
<td></td>
</tr>
<tr>
<td>Total of all vehicles</td>
<td></td>
</tr>
</tbody>
</table>
```

Fig. 2.1
(c) The students constructed divided bar graphs from the total results of their traffic survey. These are shown in Fig. 2.2 below.

![Fig. 2.2](image-url)

(i) Use the results for the period 08:30 to 09:00 in Table 2.1 (Insert) to complete the graph in Fig. 2.2. [3]

(ii) At which survey time was the percentage of taxis greater than the percentage of motorbikes?

.................................. [1]
(iii) What conclusion would you make about **Hypothesis 1: Cars are the main category (type) of vehicle in the town throughout the day**? Support your decision with evidence from Fig. 2.2.

...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
........................................................................................................................................... [4]

(iv) Suggest different reasons for the variation in the percentage of cars and lorries/vans during the day.

**Cars**

...........................................................................................................................................
...........................................................................................................................................

**Lorries/vans**

........................................................................................................................................... [2]

(d) The student decided that **Hypothesis 2: The percentage of tourist coaches varies during the day was true**. Use evidence from Fig. 2.2 to support this conclusion.

...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
........................................................................................................................................... [3]
(e) To extend her fieldwork the student decided to use a questionnaire to find out what opinions people had about the traffic-free zone in the centre of the town.

(i) Name and describe a sampling method to use with the questionnaire.

Name of sampling method .................................................................

Description of method ........................................................................
...........................................................................................................
...........................................................................................................
...........................................................................................................
...........................................................................................................
........................................................................................................... [3]

(ii) Give two advantages and two disadvantages of a traffic-free zone in a town centre.

Advantages
1 ........................................................................................................
...........................................................................................................
2 ........................................................................................................
...........................................................................................................

Disadvantages
1 ........................................................................................................
...........................................................................................................
2 ........................................................................................................
........................................................................................................... [4]

[Total: 30]