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0460/42

February/March 2017

1 hour 30 minutes

Additional Materials: Ruler
Calculator

READ THESE INSTRUCTIONS FIRST

DO **NOT** WRITE IN ANY BARCODES.

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.

Sketch maps and diagrams should be drawn whenever they serve to illustrate an answer.

The number of marks is given in brackets [] at the end of each question or part question.

This document consists of **17** printed pages, **3** blank pages and **1** Insert.

- 1 Students at a local secondary school investigated traffic flows on four roads going into the centre of the town where they lived.

They decided to investigate the following hypotheses:

Hypothesis 1: *The amount of traffic on the four roads varies during the day.*

Hypothesis 2: *Traffic congestion occurs on the four roads.*

Traffic congestion is the delay in traffic flow caused by too many vehicles.

- (a) The students organised a traffic count to test their hypotheses. Which **three** of the following decisions would they have made? Tick your choices in the table below.

Decision	Tick (✓)
to count every tenth vehicle that passed the survey point	
how long to do the traffic count for and at what time to do it	
the questions to include in a questionnaire for drivers	
the different categories of vehicles to include in the count	
the position on each road to do the vehicle counts	
to count pedestrians walking past them in one or both directions	

[3]

- (b) The recording sheet used by the students is shown in Fig. 1 (Insert).

- (i) Which **one** of the following methods would the students use to complete their recording sheet? Tick your choice in the table below.

Method	Tick (✓)
estimate	
measure	
sample	
tally	
observe	

[1]

- (ii) The students knew that traffic congestion is calculated by measuring the number of vehicles travelling along a road in one hour.

Suggest **two** disadvantages of each traffic count being done for one hour.

1

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2

.....[2]

(c) The students did their traffic survey on the roads shown in Fig. 2 (Insert). The results of their traffic count are shown in Table 1 (Insert).

(i) On which road were most vehicles counted between both 08.00–09.00 and 17.00–18.00? [1]

(ii) Plot the results for Mayo Road going into the town centre on Fig. 3 below. [2]

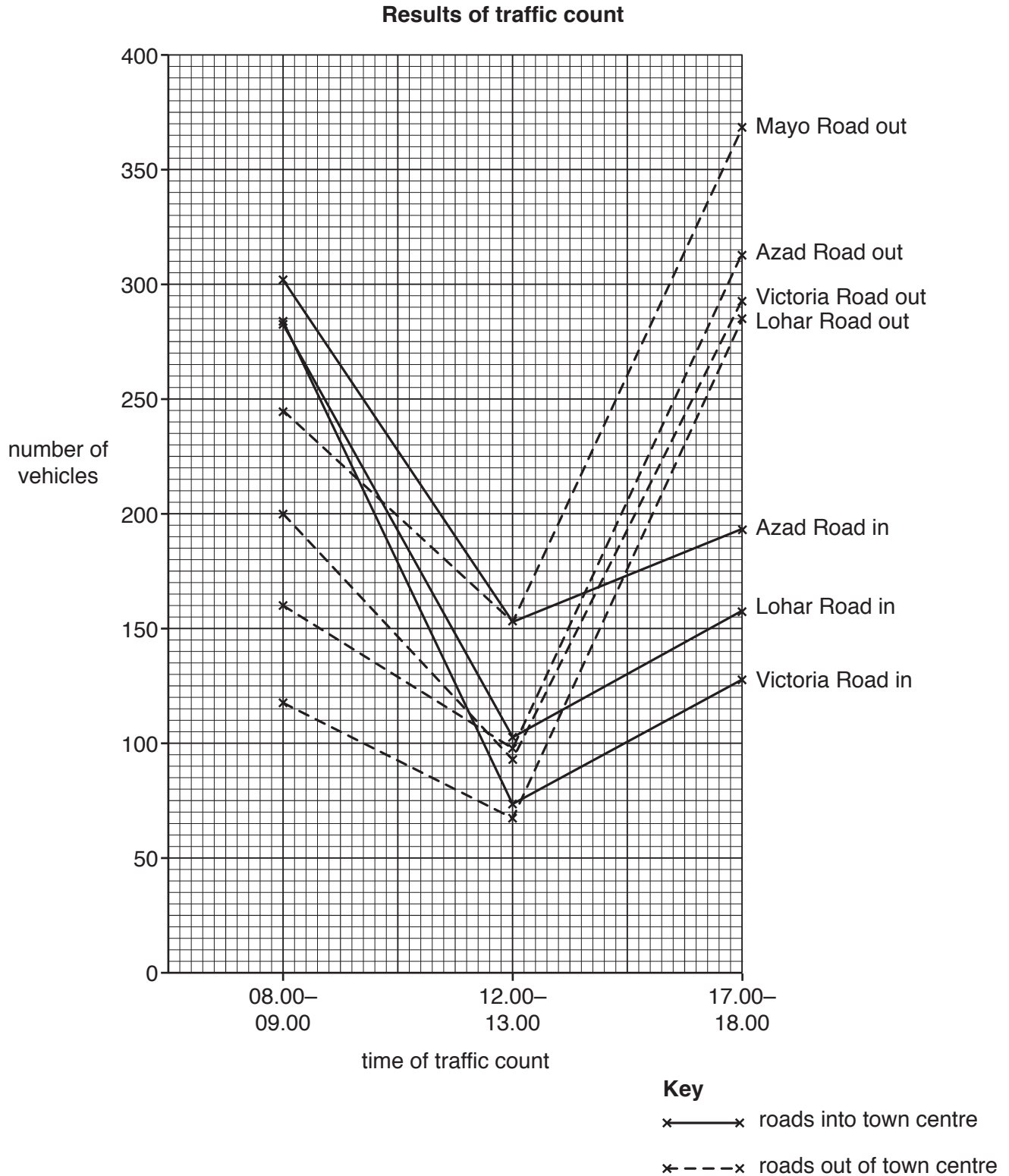


Fig. 3

- (iii) What conclusion would the students make about **Hypothesis 1**: *The amount of traffic on the four roads varies during the day*? Support your decision with evidence from Fig. 3 and Table 1 (Insert).

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.....[4]

- (d) The students' recording sheet in Fig. 1 (Insert) shows the categories of vehicles which the students counted. They used their completed recording sheets to calculate the number of vehicles in each category on the four roads. The results of these calculations are shown in Table 2 (Insert).

- (i) Use the results in Table 2 to **complete the divided bar** in Fig. 4 below to show the results for Azad Road. [3]

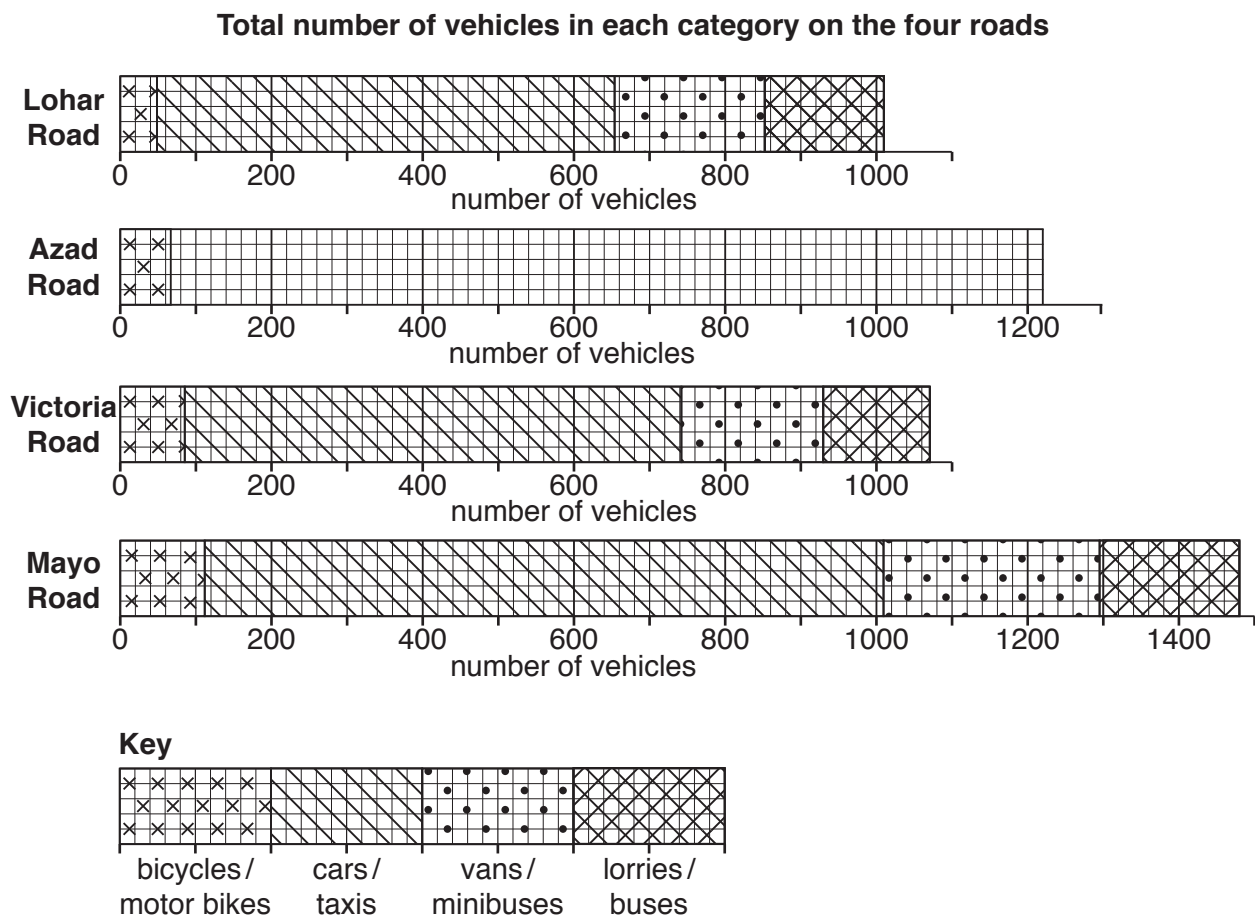


Fig. 4

- (ii) Compare the number of vehicles in each category shown in Fig. 4 and Table 2. Which **one** of the following statements is correct? Tick your choice below.

	Tick (✓)
There are fewer vehicles in all four categories on Mayo Road than on Lohar Road.	
There is the same number of vehicles in all four categories on Mayo Road and Lohar Road.	
There are more vehicles in all four categories on Mayo Road than on Lohar Road.	

[1]

- (iii) Use Fig. 4 and Table 2 to compare the number of vehicles in each category between Victoria Road and Lohar Road.

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.....[2]

- (e) To investigate **Hypothesis 2: Traffic congestion occurs on the four roads**, the students used their results to calculate an index of traffic flow. This index allocates more points to vehicles which cause more congestion, as shown in Table 3 below.

Table 3**Index of traffic flow**

vehicle category	number of points allocated per vehicle
bicycles / motor bikes	0.5
cars / taxis	1.0
vans / minibuses	2.0
lorries / buses	3.0

The results of using this index between 08.00 and 09.00 on Lohar Road going into the town centre are shown in Table 4 below.

Table 4**Index of traffic flow for Lohar Road going into the town centre between 08:00 and 09:00**

vehicle category	bicycles / motor bikes	cars / taxis	vans / minibuses	lorries / buses
number counted	8	190	60	25
points per vehicle	0.5	1.0	2.0	3.0
Index score	4	190	120	75

Total index score between 08.00 and 09.00 on Lohar Road going into the town centre = **389**

- (i) **Complete the index score** for Lohar Road going out of the town centre between 17.00 and 18.00 in Table 5 below. [1]

Table 5**Index of traffic flow for Lohar Road going out of the town centre**

vehicle category	bicycles / motor bikes	cars / taxis	vans / minibuses	lorries / buses
number counted	10	202	38	36
points per vehicle	0.5	1.0	2.0	3.0
Index score	5	202	76	

Total index score between 17.00 and 18.00 on Lohar Road going out of the town centre = **391**

TURN PAGE FOR QUESTION 1 (e)(ii)

- (ii) The results of the traffic flow calculations for all the survey sites are shown in Table 6 (Insert). **Plot the total index scores** at 08.00–09.00 and 12.00–13.00 on Victoria Road going out of the town centre on Fig. 5 opposite. [2]
- (iii) The students researched the congestion level (when delays are likely to occur) and they found out that congestion occurred when the index of traffic flow reached 375. The congestion level at each counting site is shown on Fig. 5.

Which **one** of the following conclusions about **Hypothesis 2: Traffic congestion occurs on the four roads** is correct? Tick your choice in the table below.

Conclusion	Tick (✓)
Traffic congestion occurs at all times on the four roads	
Traffic congestion occurs twice in the day on the four roads	
Traffic congestion does not occur at any time on the four roads	

Support your conclusion with evidence from Fig. 5 and Table 6 (Insert).

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.....[3]

Total index scores for traffic flow

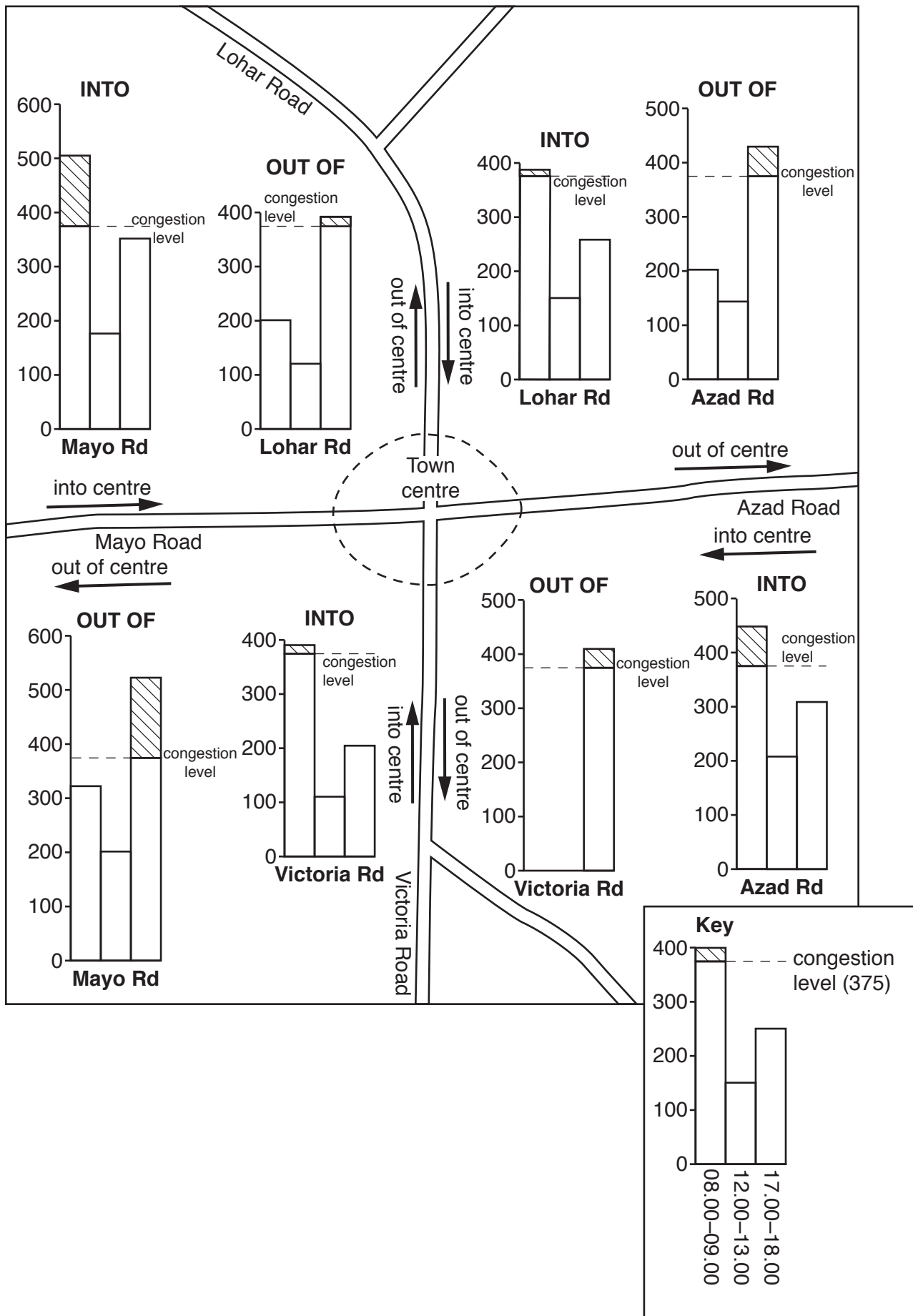


Fig. 5

(f) Suggest **two** ways to improve the data collection method used in the investigation.

1

2
[2]

(g) Suggest how traffic congestion could be reduced along the four roads leading into the town centre.

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[3]

[Total: 30 marks]

- 2 Geography students at schools in Singapore and Albany (USA) wanted to compare the weather in the two cities. They planned a fieldwork investigation using internet links between the two schools. They wanted to compare temperature and rainfall in the two cities and see if there was a link between temperature, rainfall and atmospheric pressure.

The students agreed to investigate the following hypotheses:

Hypothesis 1: *Daily maximum temperatures increase and decrease as atmospheric pressure increases and decreases.*

Hypothesis 2: *There is a relationship between changes in atmospheric pressure and changes in daily rainfall totals.*

(a) The students in Albany used traditional instruments to measure and record weather data.

- (i) What instrument would they use to measure atmospheric pressure?

.....[1]

- (ii) Which **one** of the following units is used to measure and record atmospheric pressure? Tick your answer. [1]

Unit of measurement	Tick (✓)
degrees	
knots	
millibars	
millimetres	
oktas	

- (iii) Photograph A (Insert) shows a maximum-minimum thermometer. Explain how the students would use it to measure temperature.

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.....[3]

- (iv) The students in Singapore used a digital maximum-minimum thermometer like the one shown in Photograph B (Insert). Why might students prefer to use a digital maximum-minimum thermometer rather than a traditional maximum-minimum thermometer?

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.....[2]

- (b) The students' measurements of daily maximum and minimum temperatures are shown in Figs. 6A and 7A (Insert).

- (i) Calculate the largest daily temperature range in Singapore.

..... °C [1]

- (ii) On what date is the smallest daily temperature range in Albany?

..... April [1]

- (iii) The students' measurements of daily atmospheric pressure are shown in Figs. 6B and 7B (Insert).

Describe the general pattern of change in atmospheric pressure in Singapore and Albany.

Singapore

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Albany

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.....[2]

- (iv) Do the measurements shown in Figs. 6A, 6B, 7A and 7B support **Hypothesis 1**: *Daily maximum temperatures increase and decrease as atmospheric pressure increases and decreases*? Support your decision with data from both Singapore and Albany.

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(c) To investigate **Hypothesis 2: *There is a relationship between changes in atmospheric pressure and changes in daily rainfall totals***, the students in both cities used a rain gauge like the one shown in Photograph C (Insert) to measure daily rainfall.

(i) Suggest **three** factors which the students should have considered when choosing a site for this rain gauge.

1

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3

.....[3]

(ii) The results of the rainfall measurements are shown in Figs. 8A and 8B (Insert). How much rain fell in Albany on 20th April?

..... mm [1]

(iii) The students in Singapore decided that **Hypothesis 2: *There is a relationship between changes in atmospheric pressure and changes in daily rainfall totals*** was false in their city. What evidence in Figs. 6B and 8A supports their conclusion?

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.....[2]

(iv) What conclusion about **Hypothesis 2: *There is a relationship between changes in atmospheric pressure and changes in daily rainfall totals*** would the students in Albany make from the measurements in their city? Support your decision with evidence from Figs. 7B and 8B.

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.....[4]

- (d) To extend their fieldwork, the students in both cities measured wind speed and direction.
- (i) The results of their measurements for one day are shown in Table 7 below.

Table 7

Results for 16th April

	Wind speed (km per hour)	Wind direction
Singapore	15	north east
Albany	12	south-south east

Complete Fig. 9 opposite to show the wind speed and wind direction at Albany on 16th April. [2]

- (ii) The students used an anemometer and wind vane, which are shown in Photograph D (Insert), to make their measurements. Explain how they measured wind speed and wind direction.

wind speed

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wind direction

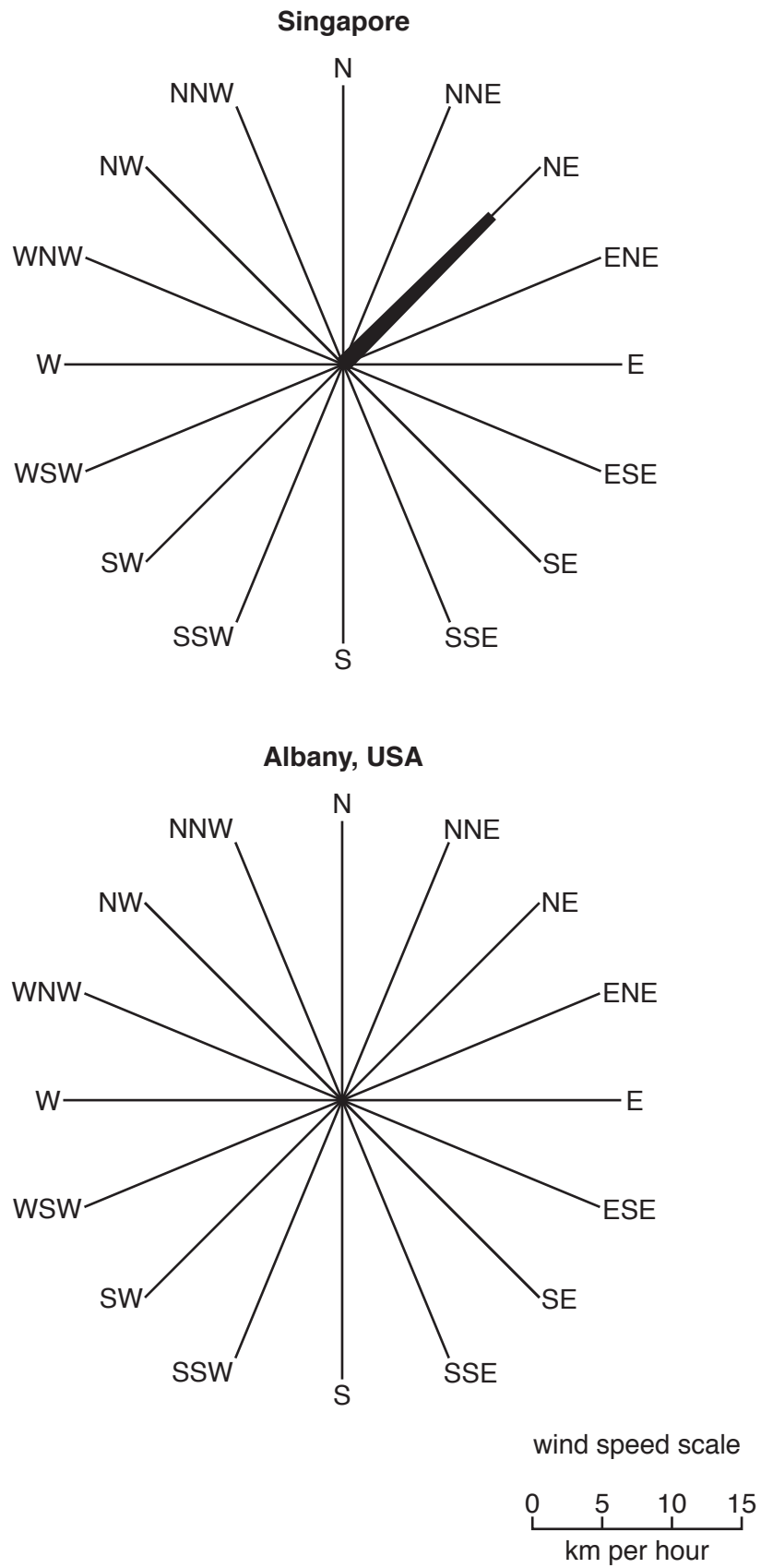
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.....[4]

[Total: 30 marks]

Wind speed and wind direction on 16th April**Fig. 9**

This image shows a full page of a handwriting practice worksheet. It consists of multiple sets of three horizontal dashed lines, providing a guide for letter height and placement. The lines are evenly spaced across the entire page, leaving ample room for writing practice. There is no text or other markings on the page.

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