AQA – Test of Hypothesis – GCSE Statistics – 2021

1. June/2022/Paper_8382/1H/No.15

You will need the **Data Sheet** to answer this question.

Shoab is a Year 11 student in a school which has a large Sixth Form.

He thinks the A-level results in Maths at his school are good.

He decides to investigate how they compare with national results.

(a) Write down a suitable hypothesis Shoab could use to investigate this.

[1 mark]

(b) His school has had a Sixth Form since 1997 so he decides to look at results for every second year starting in 1999.

Comment on his decision to use sampling rather than taking a census in this situation.

[2 marks]

(c) He calculates the proportion of students getting an A or A* grade in A-level Maths for his school.

Here are his results.

Year	Proportion
1999	0.69
2001	0.58
2003	0.46
2005	0.56

Year	Proportion
2007	0.47
2009	0.51
2011	0.63
2013	0.50

Year	Proportion
2015	0.44
2017	0.42
2019	0.37
Mean	**0.51**

The mean of these sample proportions is 0.51 (to 2 decimal places).

Here are some correct proportions for Shoab's school,

X = The true proportion of students getting an A or A* in A-level Maths for **all years** 1999 to 2019 is 0.48 (to 2 decimal places).

Y = The true proportion of students getting an A or A* in A-level Maths for the years for which Shoab collected data (1999, 2001, 2003,..., 2019) is 0.49 (to 2 decimal places).

(c) (i) Give **one** reason why the value for **X** is different to 0.51

[1 mark]

(c) (ii) Give **one** reason why the value for **Y** is different to 0.51

Your reason should be different from that used in your answer to **part (c)(i)**.

[1 mark]

(d) Shoab then uses the Internet to source information about national results achieved at A-level Maths.

He finds information for the years 2003 – 2016.

These data are on the **Data Sheet**.

(d) (i) Use Shoab's data for his school and the national data on the **Data Sheet** to complete a back-to-back stem and leaf diagram for A and A* grades for A-level Maths results.

You should only include data for years where **both** figures for his school and the national results are available, ie 2003, 2005 and so on.

[5 marks]

(d) (ii) Compare statistically the school data and the national data.

In your answer you will need to calculate and compare appropriate measures and discuss any trends you note.

[6 marks]

(e) Describe **one** issue which may affect the validity of any conclusions made.

[1 mark]

2. June/2022/Paper_8382/2H/No.6

HS2 (High Speed 2) is a faster train service that will link major cities in England.

Tom believes most people are against HS2 because it affects countryside and housing along its routes.

He decides to gather opinions about HS2.

(a) Write down a hypothesis Tom could use for his study.

[1 mark]

_____

_____

(b) Here is one of the questions from Tom's study.

How old are you?

Tick (✓) a box.

☐ under 21 ☐ 21 – 50 ☐ 51 – 60 ☐ 61 – 70

Write down **two** different problems with this question.

[2 marks]

Problem 1 _____

_____

Problem 2 _____

_____

(c) Here is an open question from Tom's study.

How much do you earn? £ _____

Write down a problem with this question.

[1 mark]

_____

_____

(d) Tom reads that HS2 will link 29 stations.

He decides to take a random sample of 5 of the stations where he can ask people for their opinions.

Briefly describe a way Tom could achieve this.

[2 marks]

(e) One of the stations Tom gets in his random sample is Manchester Piccadilly.

To find opinions, he goes there one Saturday afternoon and asks his questions to the first 100 people who will answer.

(e) (i) Name this sampling method.

[1 mark]

Answer _____

(e) (ii) What is good about Tom finding opinions in this way?

[1 mark]

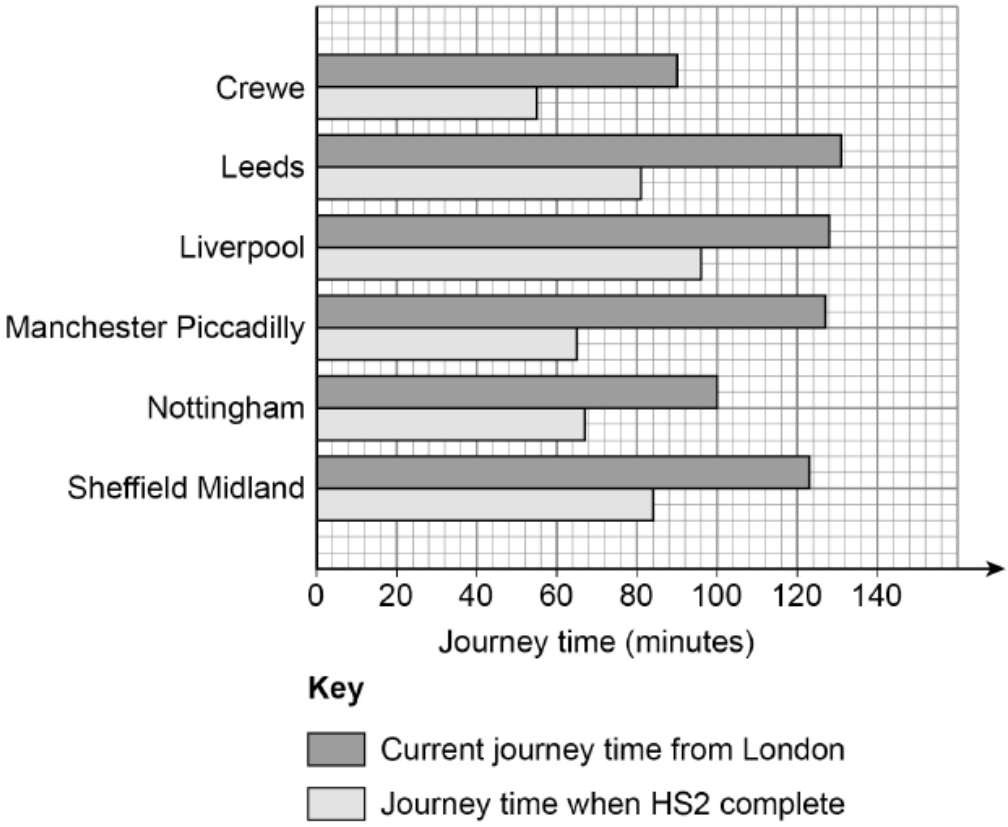
(e) (iii) What is not so good about Tom finding opinions in this way?

[1 mark]

(e) (iv) Give a reason why Tom should also find opinions of people where HS2 will **not** have a station.

[1 mark]

(f) The Department of Transport produced this graph about HS2 in 2016 showing how journey times might change when HS2 is complete.



(f) (i) Write down the name of this type of diagram.

[1 mark]

Answer _____

(f) (ii) Li Na says that the journey time between London and Manchester Piccadilly will be reduced by about an hour.

Is Li Na correct?

Tick (✓) a box.

Yes ☐ No ☐

Show working to justify your answer.

[2 marks]

(g) This table also shows information about reduced journey times from London.

London to:	Current journey time (mins)	Journey time after HS2 (mins)	Reduction time in minutes (% reduction)
Chesterfield	109	75	34 (31.2%)
Crewe	90	55	35 (38.8%)
Edinburgh	263	218	45 (17.1%)
Glasgow	272	218	54 (19.9%)
Liverpool	128	96	32 (25.0%)
Newcastle	172	139	33 (19.2%)
Preston	128	84	

Work out the missing time and percentage in the Preston row.

[3 marks]

Answer _____ mins _____ %