2021 Assessment resources GCSE Statistics

Graphs

Answers and commentaries

The question numbers in this resource reflect the question numbers from the original papers and match the question numbers in the corresponding 2021 assessment materials.

Question 2(a)

No examples available

Commentary

Note that though the key is intended to be 2 per circle, if the student gets this wrong you can follow their key to award marks for the other rows as long as it is not circle = 1.

Question 6(c)

No examples available

Commentary

Note that when drawing angles on a pie chart, there is a tolerance of +/– 2 degrees.

Question 11(a)

Please see the mark scheme

Question 10(a)

Please see the mark scheme

Question 10(b)

10 (b) Explain why the point for the first group, 20 – 29, is plotted at 25

[1 mark]

_____

_____

_____

Student A

10 (b) Explain why the point for the first group, 20 – 29, is plotted at 25

[1 mark]

Because they used the midpoint as to make it accurate as possible.

Commentary

The key part of the answer is reference to the midpoint, the second half of the sentence is certainly not contradictory.
1 mark

Student B

10 (b) Explain why the point for the first group, 20 – 29, is plotted at 25

[1 mark]

its half way betwen.

Commentary

This is a minimally acceptable response.
1 mark

Student C

10 (b)   Explain why the point for the first group, 20 – 29, is plotted at 25

[1 mark]

Because 25 is between 20 and 29

Commentary

A true statement but makes no attempt to reference the midpoint or halfway.
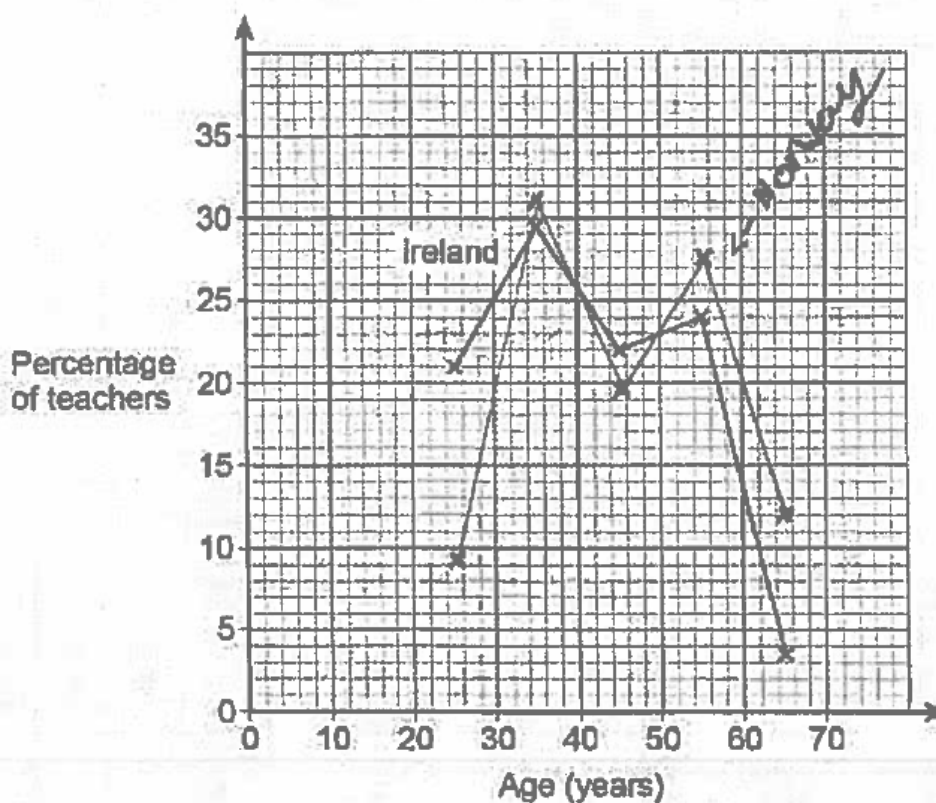
0 marks

Question 10(c)

10 (c) The table shows the percentage of teachers by age in **Norway**.

Age (years)	Percentage of teachers
20 – 29	9.2
30 – 39	31.1
40 – 49	19.8
50 – 59	27.9
60 – 69	12.0

Draw a frequency polygon for the Norway data on the same grid on page 12.

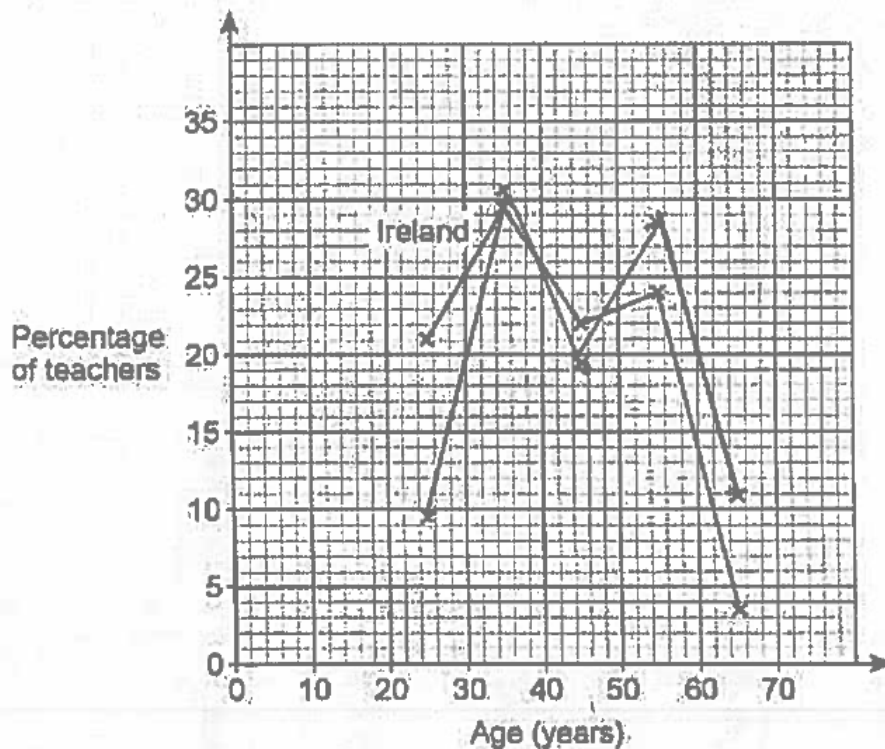**[2 marks]**

Student A

Commentary

A fully correct response (note the labelling was not required as this is only a 2-mark question)
2 marks

Student B

Commentary
One error – the final point is plotted at 11 not 12.
1 mark

Question 10(d)
No examples available

Commentary
Awarding the mark here is dependent upon the student's response from part (a).
If they chose 30 – 39 in part (a), the response should be commenting that the modal ages are the same for both countries.

Question 10(e)

10 (e) When comparing the **range** of ages for the two countries which of these is true?

Tick (✓) one box.

[2 marks]

The range is larger in Ireland.

The range is larger in Norway.

It is not possible to tell which range is larger.

The ranges are the same.

Give a reason for your answer.

_____

_____

Student A

10 (e) When comparing the **range** of ages for the two countries which of these is true?

Tick (✓) one box.

[2 marks]

The range is larger in Ireland. ☐

The range is larger in Norway. ☐

It is not possible to tell which range is larger. ☑

The ranges are the same. ☐

Give a reason for your answer.

they are plotted at the midpoint

Commentary

Correct box ticked but no reference to not knowing the maximum or minimum values for each country.

1 mark

Student B

10 (e) When comparing the **range** of ages for the two countries which of these is true?

Tick (✓) one box.

[2 marks]

The range is larger in Ireland.	☐
The range is larger in Norway.	☐
It is not possible to tell which range is larger.	✓
The ranges are the same.	☐

Give a reason for your answer.

because the data is grouped

Commentary

The bar for the reason mark is quite high on this question. The student needs to say more about what the 'being grouped' means in terms of not being able to work out the range.

1 mark

Question 10(f)

10 (f) Make **one** further comparison between the data for Ireland and Norway.

[1 mark]

_____

_____

Student A

10 (f) Make one further comparison between the data for Ireland and Norway.

[1 mark]

They both have a steep decrease of teachers from the age of (50-59) to (60-69).

Commentary

One of many possible correct answers citing any other feature of the two graphs.

1 mark

Student B

10 (f) Make one further comparison between the data for Ireland and Norway.

[1 mark]

In Norway the lowest percentage of teachers it is in the age group 20-24 while the lowest percentage of teachers in norway is in the 60-69 age bracket

Commentary

Another suitable response.

1 mark

Student C

10 (f) Make one further comparison between the data for Ireland and Norway.

[1 mark]

Higher percentage of teachers work longer in Norway

Commentary

This may or may not be true and cannot be ascertained from the graphs.
0 marks

Question 8(a)

No examples available

Question 8(b)

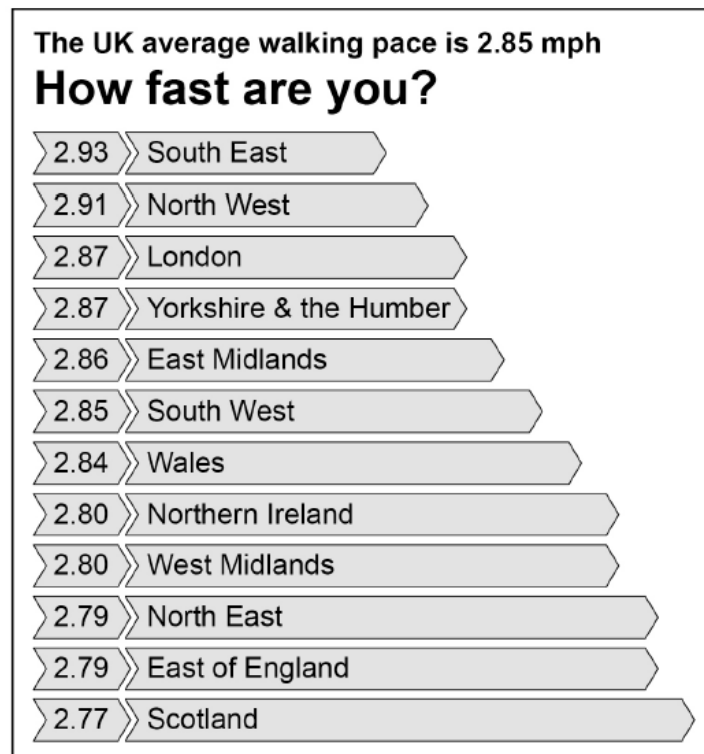No examples available

Question 8(c)

No examples available

Commentary

Though a range of possible answers is acceptable, the student must give their answer as an integer to reflect the context.

Question 10(a)

10   Samira records the average walking speed, in miles per hour (mph), of shoppers in different regions of the UK. The diagram shows her results.

The UK average walking pace is 2.85 mph

How fast are you?

Speed	Region
2.93	South East
2.91	North West
2.87	London
2.87	Yorkshire & the Humber
2.86	East Midlands
2.85	South West
2.84	Wales
2.80	Northern Ireland
2.80	West Midlands
2.79	North East
2.79	East of England
2.77	Scotland

10 (a)   List the regions in the UK where the walking speed is more than 0.05 mph faster than the **UK average**.

[1 mark]

Answer   _____

_____

Student A

10 (a)   List the regions in the UK where the walking speed is more than 0.05 mph faster than the **UK average**.

[1 mark]

Answer   <u>South East and North</u>
<u>west</u>

Commentary
A correct response.
1 mark

Student B

10 (a)   List the regions in the UK where the walking speed is more than 0.05 mph faster than the UK average.

[1 mark]

Answer   North-west.

Commentary

Both of the correct regions are required to score the mark.

0 marks

Student C

10 (a)   List the regions in the UK where the walking speed is more than 0.05 mph faster than the UK average.

[1 mark]

Answer   North west and South east

2.85 + 0.05 = 2.9

Commentary

Any numbers mentioned in the response can be ignored.

1 mark

Question 10(b)

10 (b) Give **two** reasons why the diagram is misleading.

[2 marks]

Reason 1 _____

_____

_____

Reason 2 _____

_____

_____

Student A

10 (b) Give **two** reasons why the diagram is misleading.

[2 marks]

Reason 1 ~~Sco Sco~~ Scotland has the slowest walking pass by the graph layout makes it seem it is ✓ the the gastest

Reason 2 Samira is askeng how fast you are in general rather than shopping

Commentary

Reference made in reason 1 to the perception difference between the values and the length of the bars. Reason 2 is not accepted as the question is asking about why the **diagram** is misleading, not the collected data.

1 mark

Student B

10 (b) Give two reasons why the diagram is misleading.

[2 marks]

Reason 1 _Because the bars are longer for the ~~less~~ ~~start for~~ worse average walking pace._

Reason 2 _There is no Y or X axis used to show data so the bars are ~~different.~~ ~~irrelevant.~~ irrelevent._

Commentary

Reason 2 is deemed an acceptable attempt to explain the lack of scales or units on the measurements.

2 marks

10 (c) A manager in a shopping centre measures the walking speed (in mph) of a random sample of shoppers in June and a random sample of shoppers in December.

The walking speeds of 25 shoppers in June are shown in the stem-and-leaf diagram.

June											December								
						9	8	**0**										
				7	7	6	4	2	**1**										
9	8	8	7	6	5	5	2	**2**										
			7	6	4	3	3	1	**3**										
				5	4	1	0	**4**										

Key: 8 | 0 | 7 represents a speed of 0.8 mph in June
and a speed of 0.7 mph in December

10 (c) (i) The speeds (in mph) of 25 shoppers in December are,

1.2	3.4	0.9	1.9	2.4	2.7	1.6	3.2	2.1	0.7
1.0	2.2	2.5	1.8	4.1	1.7	2.6	1.8	3.2	1.3
2.5	0.7	3.1	2.2	1.4					

Complete the back to back stem-and-leaf diagram above to show the speeds of shoppers in December.

[3 marks]

Student A

June		December
9 8	0	7 7 9
7 7 6 4 2	1	0 2 3 4 6 7 8 8 9
9 8 8 7 6 5 5 2	2	1 2 2 4 5 5 6 7
7 6 4 3 3 1	3	1 2 2 4
5 4 1 0	4	1

Key: 8 | 0 | 7 represents a speed of 0.8 mph in June and a speed of 0.7 mph in December

Commentary
Fully correct response
3 marks

Student B

June		December
9 8	0	7 7 9
7 7 6 4 2	1	0 2 3 4 6 7 8 8 9
9 8 8 7 6 5 5 2	2	1 2 2 4 5 5 6 7
7 6 4 3 3 1	3	1 2 2 4
5 4 1 0	4	

Key: 8 | 0 | 7 represents a speed of 0.8 mph in June and a speed of 0.7 mph in December

Commentary
Omission of the leaf '1' on the bottom row.
2 marks

Student C

June										December											
						9	8	0	9 7 7												
		7	7	6	4	2	1	2 9 6 3 8 7 8 0 4													
9	8 8	7	6	5	5	2	2	4 7 6 5 2 5 2													
	7	6	4	3	3	1	3	4 2 2 1													
		5	4	1	0	4															

Key: 8 | 0 | 7 represents a speed of 0.8 mph in June
and a speed of 0.7 mph in December

Key 1 | 2 represents
1.2 (mph)

(c) (i) The speeds (in mph) of 25 shoppers in December are,

1.2 3.4 0.9 1.0 2.4 2.7 1.6 3.2 2.1 0.7

7.0 2.2 2.5 1.8 4.1 1.7 2.6 1.8 3.2 1.5

2.5 0.7 3.1 2.2 1.4

Complete the back to back stem-and-leaf diagram above to show the speeds of
shoppers in December.

December.

[3 marks]

```
0 | 7 7 9
1 | 0 2 3 4 6 7 8 8 9
2 | 1 2 2 4 5 5 6 7
3 | 1 2 2 4
4 | 1
```

Commentary
The student has drawn a new version of the diagram in the white space which is acceptable. Whilst
the values are all correct, the vertical alignment has gone badly wrong for the top row and
therefore, as per the additional guidance, only 2 marks can be awarded.
2 marks

Question 10(c)(ii)

10 (c) (ii) Without further calculation, make a comparison of the average walking speeds of shoppers in June and December.

[1 mark]

Student A

In June a lot more people where walking at a faster Speed than in December.

Commentary

Acceptable response (as long as students don't say that **all** people walk faster in June)
1 mark

Student B

most people walked slower in december

Commentary

An alternative way of saying the same thing by focussing on December.
1 mark

Question 10(c)(iii)

10 (c) (iii) Give a possible reason to explain the difference in average walking speeds in June and December.

[1 mark]

_____

_____

Student A

It is waully cold in december and people more slower when their cold.

Commentary

It doesn't seem reasonable to equate it being colder to walking slower – these types of references were allowed if mention was made of things like underfoot icy conditions or similar.

0 marks

Student B

December is near to Christmas so it will he crowded so its harder to walk fast.

Commentary

Suitable reference to time of year / Christmas shopping.
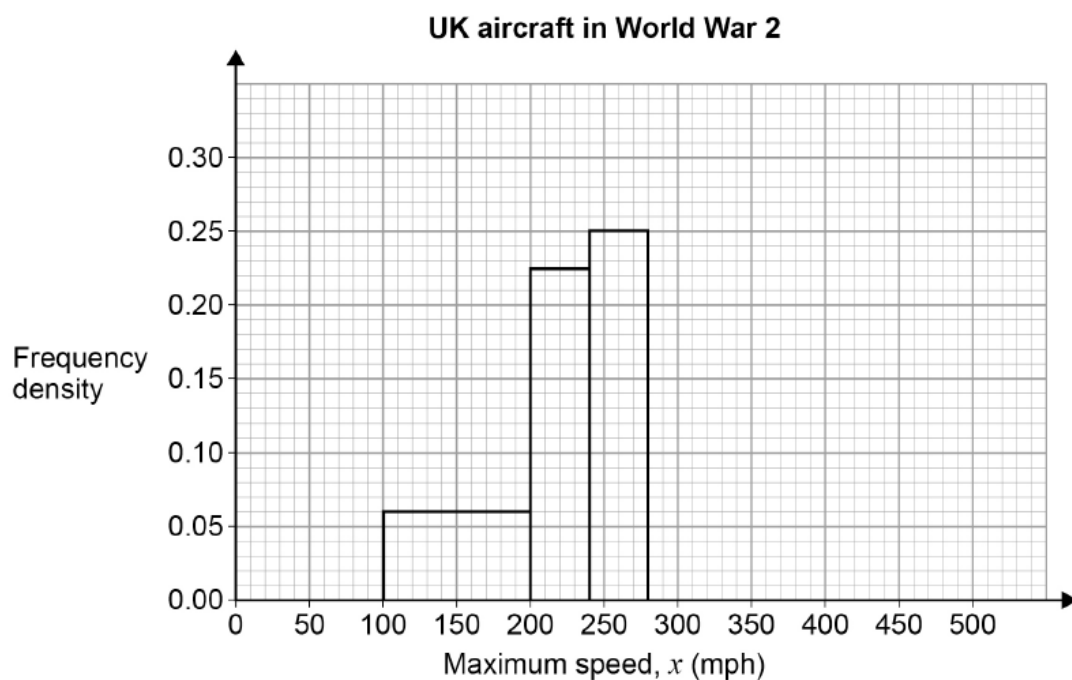
1 mark

Question 15(a)

15   An air museum has aircraft that were used by the UK in the two World Wars.

15 (a)   The table shows the maximum speed (mph) of the museum's aircraft from **World War 2**

Maximum speed, x (mph)	Number of aircraft	
$100 \leqslant x < 200$	6	
$200 \leqslant x < 240$	9	
$240 \leqslant x < 280$	10	
$280 \leqslant x < 320$	6	
$320 \leqslant x < 400$	6	
$400 \leqslant x < 500$	3	

Complete the histogram to show the information.

[2 marks]

UK aircraft in World War 2

Student A

Maximum speed, x (mph)	Number of aircraft	Frequency Density
$100 \leqslant x < 200$	6	0.6
$200 \leqslant x < 240$	9	0.225
$240 \leqslant x < 280$	10	0.25
$280 \leqslant x < 320$	6	0.15
$320 \leqslant x < 400$	6	0.075
$400 \leqslant x < 500$	3	0.3

Complete the histogram to show the information.

[2 marks]

UK aircraft in World War 2
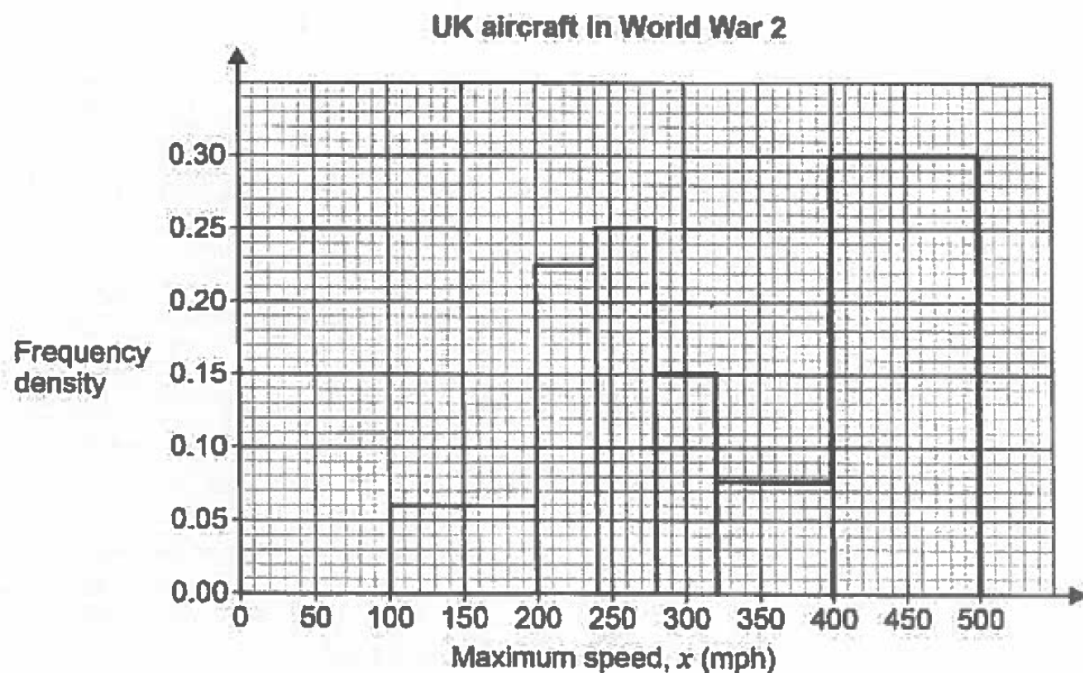
Commentary

There is an error in the final frequency density in the table.

1 mark

Student B

Maximum speed, x (mph)		Number of aircraft	
✗	100 < x < 200	6	
✗	200 < x < 240	9	
✓	240 < x < 280	10	
✓	280 < x < 320	6	
✓	320 < x < 400	6	
	400 < x < 500	3	

Complete the histogram to show the information.

[2 marks]

UK aircraft in World War 2

Commentary

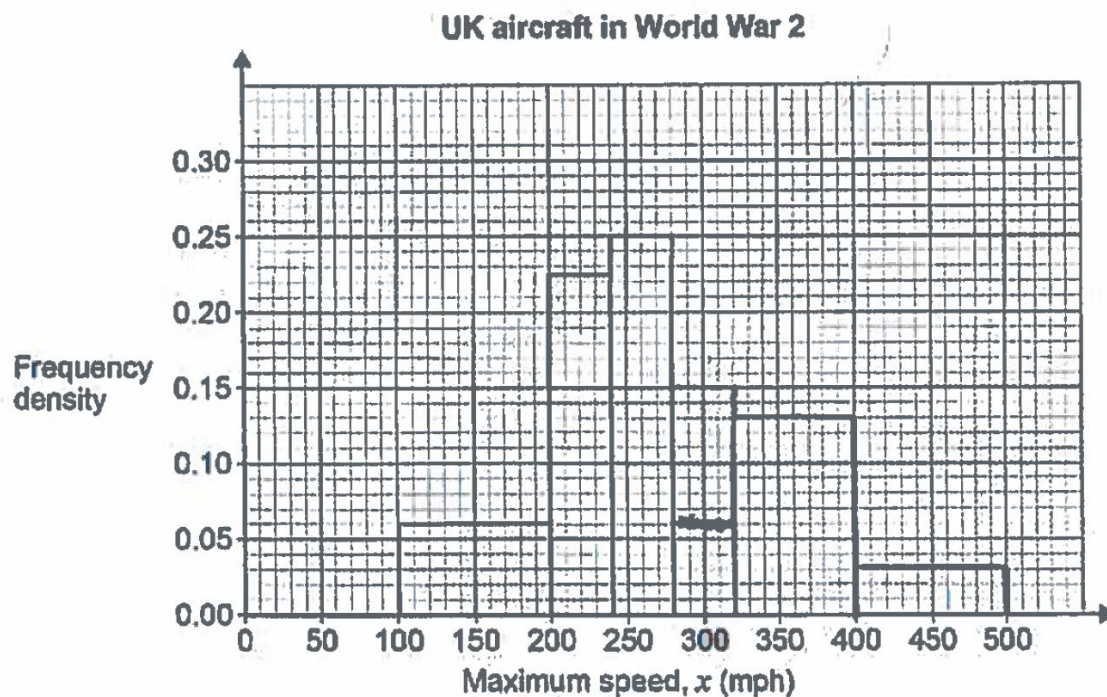Though the table is blank, this is not a problem as the histogram has been correctly completed on the axes.

2 marks

Student C

Maximum speed, x (mph)	Number of aircraft	
$100 < x < 200$	6	
$200 < x < 240$	9	
$240 < x < 280$	10	
$280 < x < 320$	6	
$320 < x < 400$	6	
$400 < x < 500$	3	

Complete the histogram to show the information.

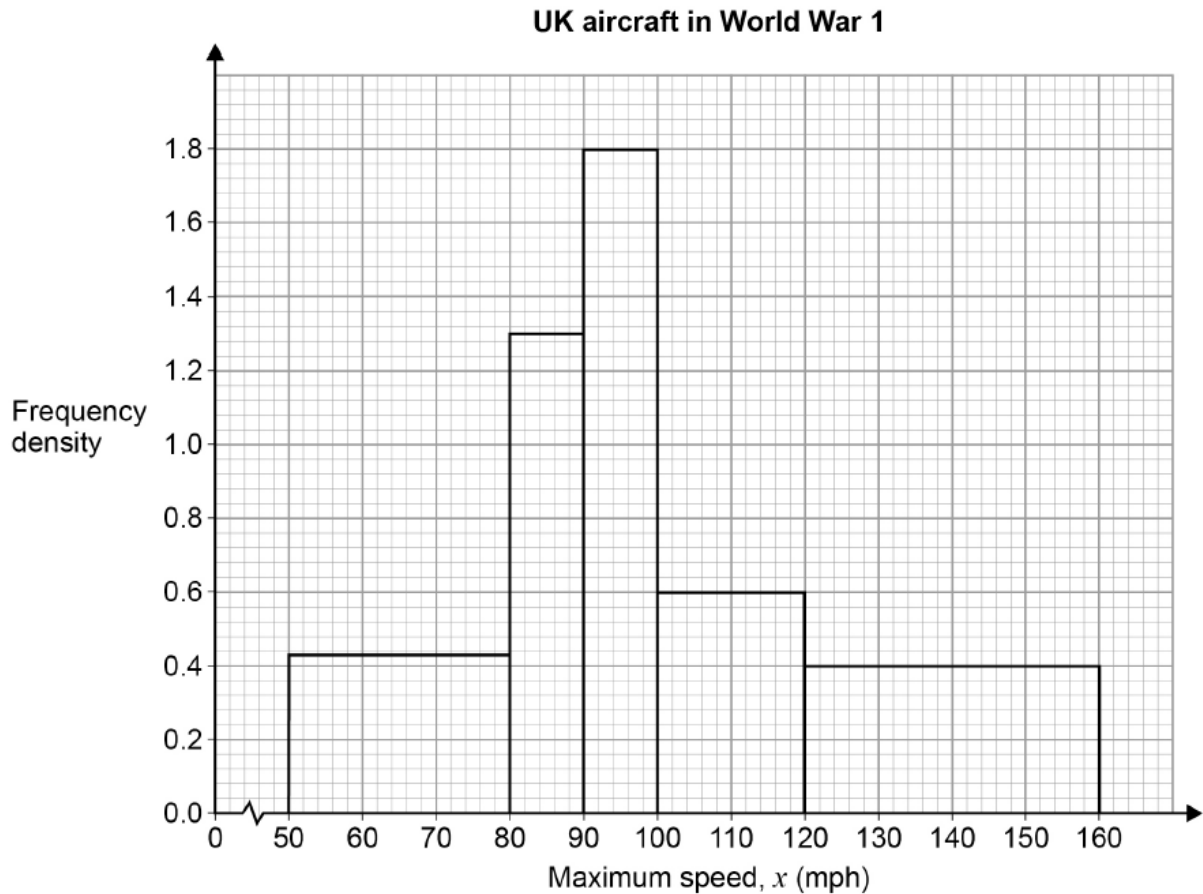[2 marks]

UK aircraft in World War 2

Commentary

The student's 1st and 3rd bars are correct showing that the frequency densities have been calculated correctly, but the 320 – 400 bar is incorrect so cannot score full marks.

1 mark

Question 15(b)

15 (b) This histogram shows the maximum speed of the museum's 72 aircraft from
World War 1

UK aircraft in World War 1

Estimate the number of these aircraft that had a maximum speed of between
90 mph and 115 mph.

[3 marks]

_____

_____

_____

_____

Answer _____

Student A

Estimate the number of these aircraft that had a maximum speed of between 90 mph and 115 mph.

[3 marks]

$$(1.8 \times 10) + (0.6 \times 20) + (3.4 \times 40) =$$

46

Answer   46

Commentary

The first product is correct and therefore the response can score the first M1.

1 mark

Student B

Estimate the number of these aircraft that had a maximum speed of between 90 mph and 115 mph.

[3 marks]

$10 \times 1.8 = 18$

$20 \times 0.6 = 12$

$12 \times \frac{3}{4} = 9$

$9 + 18 = 27$

Answer   27

Commentary

A fully correct response.

3 marks

Student C

Estimate the number of these aircraft that had a maximum speed of between 90 mph and 115 mph.

[3 marks]

_____

_____

_____

_____

Answer _____ 27 _____

Commentary

Not advisable at all, but the student has achieved the correct answer and, as it was judged highly unlikely that it would be possible to guess the correct answer, there was no instruction saying "you **must** show your working. Clearly showing working is highly advisable.

3 marks

15 (c) Ewan says that the fastest of the museum's aircraft from World War 1 is slower than all of the museum's aircraft from World War 2

Is Ewan correct?

Tick (✓) one box.

Yes ☐   No ☐   Cannot tell ☐

Give a reason for your answer.

[2 marks]

Reason _____

_____

_____

_____

Student A

Yes ☐   No ☐   Cannot tell ☑

Give a reason for your answer.

[2 marks]

Reason _____There are no exact speeds given for any aircraft, only_____

_____in class intervals._____

Commentary

On this occasion, there is a mark for ticking the correct box as long as a reason is properly attempted. The reason given here is not correct.

1 mark

Student B

Yes ☐ No ☐ Cannot tell ☑

Give a reason for your answer.

[2 marks]

Reason _The classes overlap and so some World War 2 planes may be slower than World War 1 planes however, this isn't shown._

Commentary
A good explanation given.
2 marks

Student C

Yes ☐ No ☐ Cannot tell ☑

Give a reason for your answer.

[2 marks]

Reason _It depends on how fast the aircraft in the 100 – 200 category for WW2 are distributed, it is true if they are all faster than 160 mph but they could be slower._

Commentary
A slightly different but equally good explanation.
2 marks