



General Certificate of Secondary Education
2023

Centre Number

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Candidate Number

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Statistics

Unit 2 (With Calculator)

Foundation Tier



[GST21]

GST21

MONDAY 19 JUNE, AFTERNOON

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

Any working **must** be clearly shown in the spaces provided. Marks may be awarded for partially correct solutions.

Answer **all nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 80.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

You should have a calculator, ruler, compasses and protractor.

There is no formula sheet for this examination.



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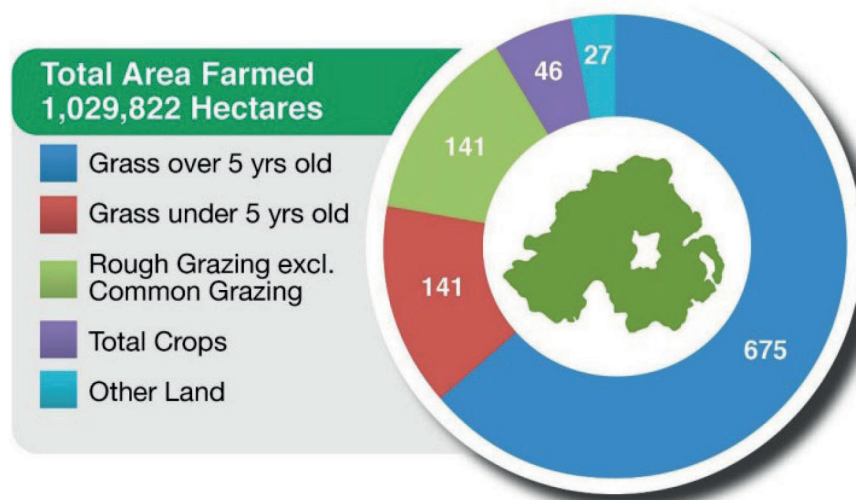


24GST2102



1 The diagram below shows the land use, to the nearest 1000 hectares, for farms in Northern Ireland in 2020

Land use by agricultural production type, 2020



Source: © Crown Copyright / NIRSA

(a) What area of land is used for crops?

_____ [2]

(b) Which agricultural production types used the same amount of land in 2020?

_____ [1]

(c) (i) Write down the modal land use for farms in Northern Ireland in 2020

_____ [1]

(ii) How is this shown in the diagram?

_____ [1]

[Turn over



- 2 A school principal is concerned about the speed of the vehicles travelling on a rural road that is beside his school.

He asks for strips to be laid across the road that record the speeds of all vehicles that use the road.

- (a) What is the name of this method of data collection?

_____ [1]

The speeds of all the vehicles that pass over the strips are recorded on a Tuesday morning in September between 8.30 am and 9.30 am.

The speeds are given below in miles per hour (mph).

38	43	47	39	45
29	46	42	32	38
42	40	33	41	27
50	42	36	38	41

- (b) Complete the table below for the speeds of the vehicles.

Speed in miles per hour	Tally	Frequency
26–30		
31–35		
36–40		
41–45		
46–50		

[2]

From the results, the principal works out that half of the vehicles were travelling above the speed limit.

- (c) What does the data in the table suggest the current speed limit on this section of road is?

Circle the correct answer.

30 mph

40 mph

50 mph

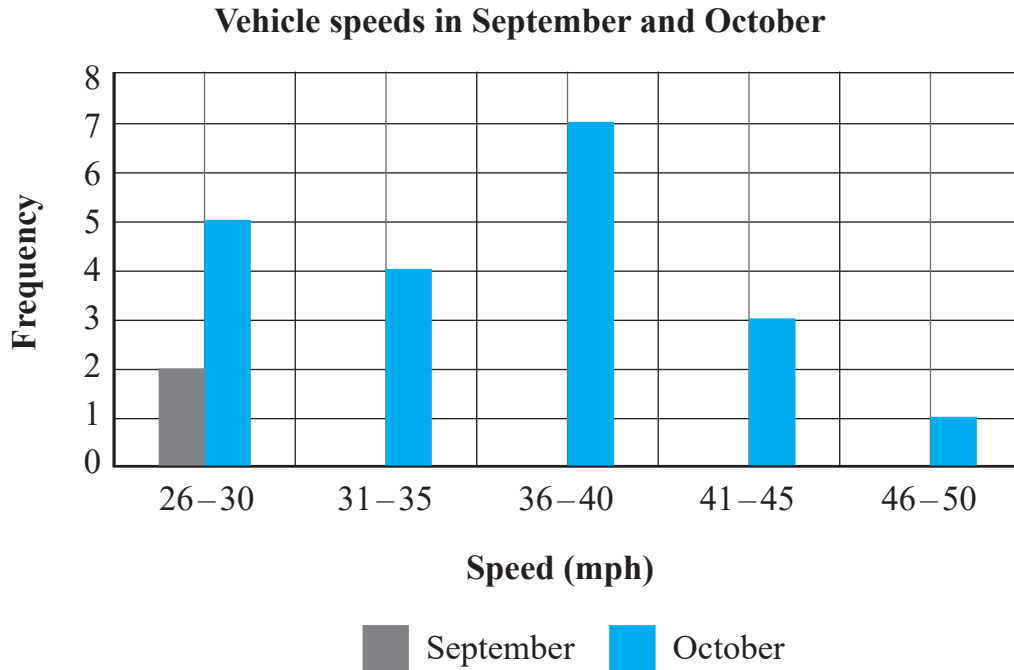
[1]



At the beginning of October, the school installs a sign warning drivers to slow down.

The following Tuesday morning, the speeds of all vehicles on the road between 8.30 am and 9.30 am are recorded.

These results are shown in the partially completed dual bar chart below.



(d) Use the data for September in the table in part (b) to complete the dual bar chart. The first one is already done for you. [2]

(e) (i) Do you believe that the warning sign has had an effect on vehicle speeds?

Tick the correct box.

Yes No [1]

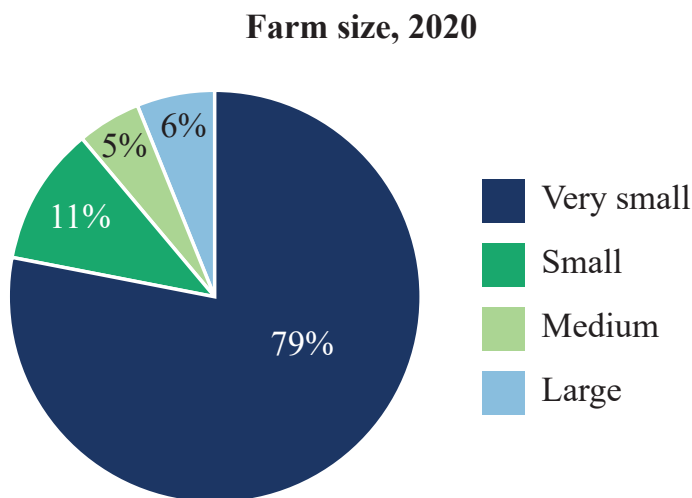
(ii) Give a reason for your answer.

_____ [1]

[Turn over



- 3 The chart below shows the percentage of farms by size category in Northern Ireland in 2020



- (a) In which size category were there the lowest number of farms in 2020?

_____ [1]

- (b) The percentages in the chart do not add to 100%.

Suggest a reason for this.

_____ [1]

- (c) Of the 25 896 farms, 2850 were in one of the size categories.

Which size category was this?

Show your working.

_____ [3]



(d) Aaron makes the statement: “Over three quarters of all the farms in Northern Ireland are very small farms.”

Do you agree with Aaron’s statement? Explain your answer.

[2]



- 4 Ms Maguire wants to see if a new online Maths revision programme she has introduced is improving the Year 8 test scores.

She tested all 180 of the Year 8 students before she started the programme.

Ms Maguire now wants to test a sample of 20 of them. She decides to select a systematic sample.

- (a) Describe the steps she should take to select a systematic sample of 20 students.

[3]

Ms Maguire also wants to see if the boys and girls are responding to the online programme differently.

- (b) Why might a systematic sample not be the best type of sample to use if she is comparing boys and girls?

[1]

- (c) Suggest a more suitable sampling method she could use for this purpose.

[1]



After taking a sample of 10 boys and 10 girls, Ms Maguire records the percentage increase in test scores.

The percentage increases of the 10 girls are recorded below:

2.4% -3.0% 6.2% -1.8% 5.5% 3.4% 0.5% 5.0% 4.2% 7.1%

(d) (i) Work out the median percentage increase for the girls.

_____ % [2]

(ii) Calculate the interquartile range for the girls.

_____ % [3]

Ms Maguire calculates the median percentage increase for the 10 boys to be 4.5% and the interquartile range in percentage increase for the boys to be 6.3%.

(e) Comment on the differences in the test scores of the boys and the girls in the sample.

[4]

[Turn over



5 Charlie wishes to find out if schools in County Tyrone are more likely to use tablets, laptops or a combination of both.

He plans to send a survey by post to a sample of schools in County Tyrone.

(a) What is the sampling frame for this task?

_____ [1]

A colleague suggests to him that he should telephone the schools he chooses for the sample instead of sending a survey by post.

(b) Give an advantage for each of these methods of data collection.

Postal survey advantage _____ [1]

Telephone survey advantage _____ [1]

(c) Suggest a way he could ensure he has a high response rate when sending the surveys by post.

_____ [1]

He decides to send the survey by post and he gets 50 responses.

(d) Is the data he has collected primary or secondary data?

Tick the correct box.

Primary Secondary

[1]



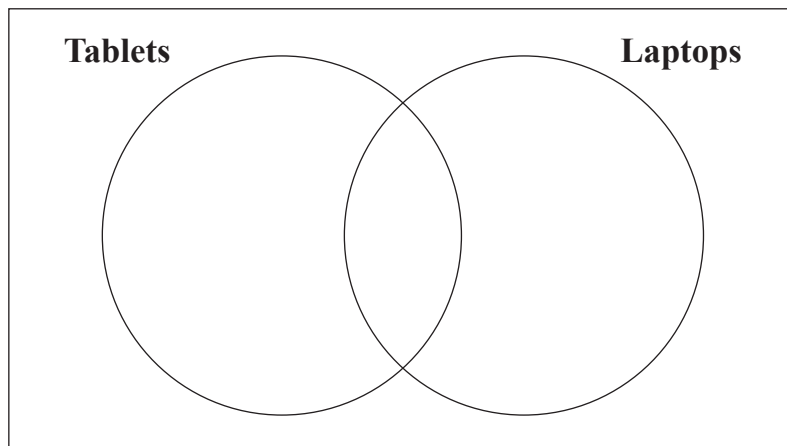
The information from the 50 responses is summarised as follows:

- All of the schools use tablets or laptops or both.
- 41 schools use tablets.
- 36 schools use laptops.

(e) (i) Find the number of schools that use both tablets and laptops.

_____ [2]

(ii) Complete the Venn diagram below.



[2]



6 Some farms in Northern Ireland are cattle farms.

Anne is investigating if the size of farm is related to whether the farm keeps mainly beef cows or dairy cows.

She intends to use the statistical enquiry cycle to carry out her investigation.

(a) Write down a suitable hypothesis Anne could use for her investigation.

[1]

(b) What data would Anne need to collect?

[2]

(c) Suggest a suitable source for Anne's data.

[1]

(d) Name a suitable diagram Anne could use to present her results.

[1]

(e) How could this diagram help Anne to decide if her initial hypothesis is correct?

[2]



7 A farmer with a large flock of sheep is concerned about a potential outbreak of the Bluetongue virus, which can be fatal for sheep.

In a recent outbreak, the average risk of death from Bluetongue was 5%.

The farmer has 360 sheep in his flock.

(a) How many sheep would the farmer expect to die from Bluetongue if an outbreak were to occur on his farm?

_____ [2]

He then reads that a vaccine is available which reduces the risk of death to 1 out of every 200 sheep in a flock.

(b) Express this risk as a percentage.

_____ % [2]

(c) How many sheep in his flock would he expect to die from Bluetongue if all his sheep were vaccinated?

_____ [2]

[Turn over



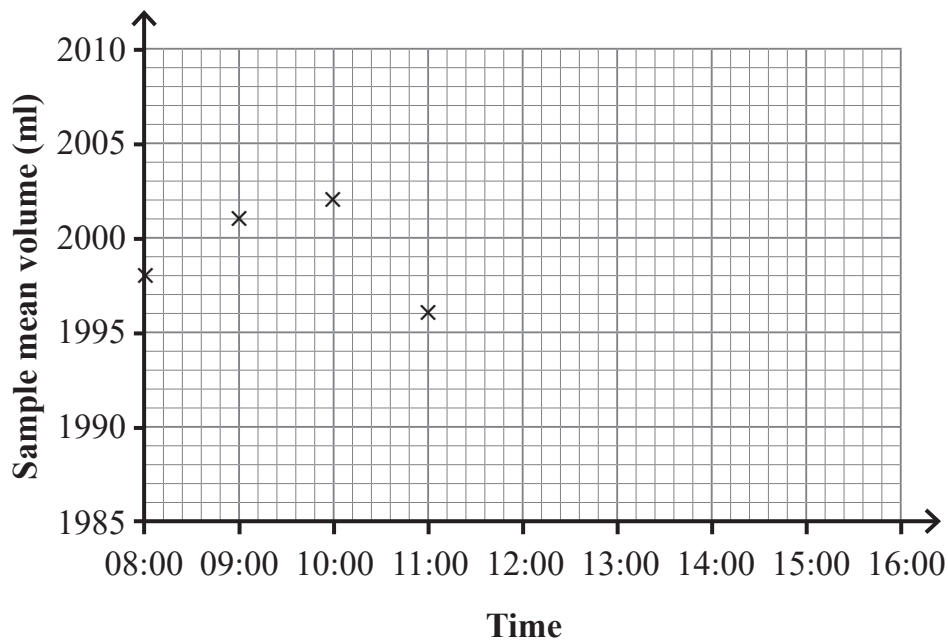
8 A machine is programmed to fill bottles with 2000 ml of lemonade.

Samples are taken every hour and the sample mean is recorded.

The sample means for one day are given in the table below.

Time	Sample mean volume (ml)
08:00	1998
09:00	2001
10:00	2002
11:00	1996
12:00	2003
13:00	2003
14:00	2004
15:00	2007

(a) Plot the last four sample means on the control chart below.



[2]



The production manager has decided that warning lines should go onto the control chart at 5 ml above and below the target volume of 2000 ml.

Action lines should be added at 8 ml above and below the target volume.

(b) Draw and label the target, warning and action lines on the control chart. [3]

(c) What advice would you give to the production manager based on the control chart?

[3]

[Turn over



The general manager and the production manager have a meeting to discuss how the quality assurance system might be improved.

The general manager states:

“We should take samples every half an hour.”

(d) Give an advantage and a disadvantage of this suggestion.

Advantage _____
_____ [1]

Disadvantage _____
_____ [1]

The production manager states:

“We should reduce our warning and action limits to 3 ml and 5 ml outside the target volume.”

(e) Give an advantage and a disadvantage of this suggestion.

Advantage _____
_____ [1]

Disadvantage _____
_____ [1]

(f) Why would it be useful to calculate a sample range as well as a sample mean as part of the quality assurance process?

_____ [2]





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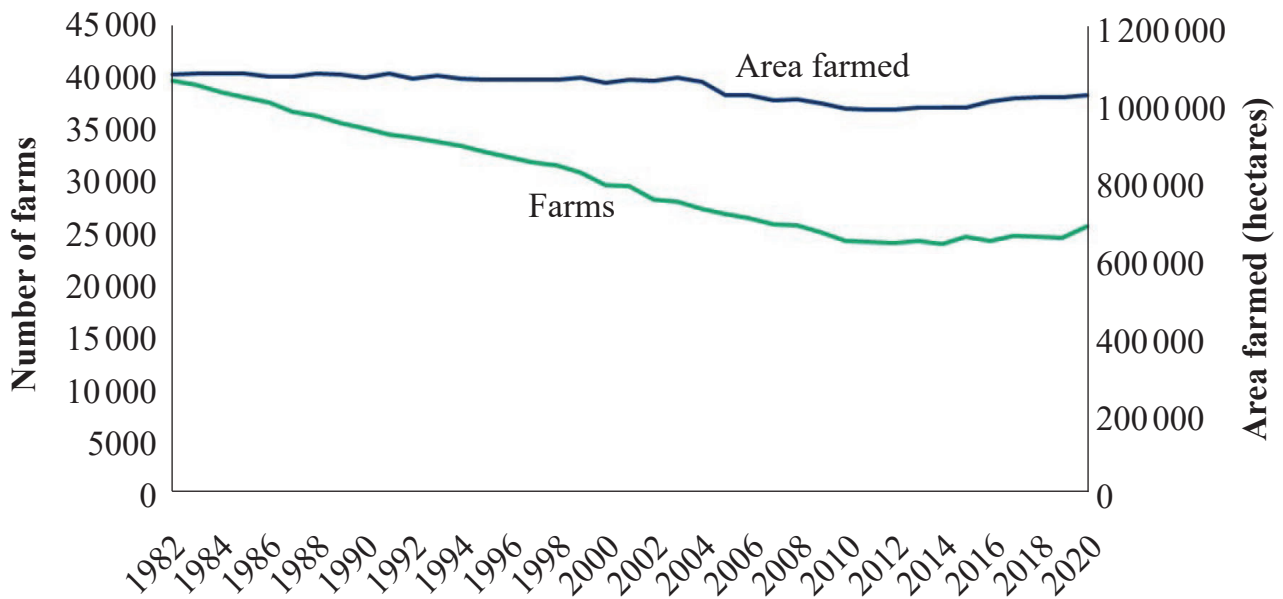
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- 9 The diagram below shows the number of farms and area farmed in Northern Ireland between 1982 and 2020

Number of farms and area farmed, 1982–2020



Source: © Crown Copyright / NIRSA

- (a) Calculate the approximate mean area farmed on a farm in Northern Ireland in 2020

_____ hectares [3]

- (b) Compare the trend in the number of farms with the trend in the area farmed.

_____ [2]



(c) Suggest a reason for the differences in these trends.

[1]



The table below shows the total number of pigs and the number of large farms in Northern Ireland from 2010 to 2019

Year	Total number of pigs	Number of large farms
2010	424 604	1493
2011	425 268	1518
2012	426 924	1558
2013	480 317	1534
2014	517 075	1546
2015	569 738	1629
2016	601 101	1701
2017	649 120	1722
2018	633 644	1693
2019	674 428	1680

(d) Calculate the product moment correlation coefficient for the data in the table.

_____ [2]

(e) (i) State the type of correlation found between the number of large farms and the total number of pigs.

_____ [1]

(ii) Give an interpretation of what the value calculated in part (d) means in context.

 _____ [1]





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Examiner Number

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