

Name: _____

Central Tendency and Dispersion

Revision Questions

Date: _____

Time:

Total marks available: 59

Total marks achieved: _____

Questions

Q1.

Megan was interested in whether there was a difference in obedience reported by males and females.

Megan recruited a group of males (group A) and a group of females (group B) from a local college for her investigation. To measure obedience, she asked the participants to record how many times they disobeyed a parent or guardian's request during a 30-day period.

The results of Megan's investigation are shown in **Table 1** below.

Group A: Males	Number of times the participant disobeyed a parent / guardian request (in 30 days)	Group B: Females	Number of times the participant disobeyed a parent / guardian request (in 30 days)
A	2	A	16
B	10	B	4
C	12	C	13
D	8	D	5
E	10	E	11
F	8	F	10
G	5	G	18
H	9	H	11

Table 1

(a) Calculate the median number of times the **male** participants disobeyed a parent / guardian request (in 30 days).

(1)

SPACE FOR CALCULATIONS

Median for males

(b) Calculate the mean number of times the **female** participants disobeyed a parent / guardian request (in 30 days).

(1)

SPACE FOR CALCULATIONS

Mean for females

Group A: Males	Number of times the participant disobeyed a parent / guardian request (in 30 days)	$(x - \bar{x})$	$(x - \bar{x})^2$
A	2	-6	36
B	10	2	4
C	12	4	16
D	8	0	0
E	10	2	4
F	8	0	0
G	5	-3	9
H	9	1	1
Total	64	Total	
Mean \bar{x}	8		

Table 2

(c) Using the data in **Table 2**, calculate the standard deviation for the number of times the male participants disobeyed a parent / guardian request (in 30 days).

You must show your working and give your answer to **two** decimal places.

(3)

SPACE FOR CALCULATIONS

Standard deviation

(Total for question = 5 marks)

Q2.

Jack wanted to investigate whether males were prejudiced towards females who worked in stereotypical male professions, such as building work and lorry driving.

He asked five males to answer a questionnaire about gender roles. Participant responses were scored out of 10 for gender prejudice, with 10 indicating a very strong gender prejudice, and 0 indicating little or no gender prejudice.

Jack's results are shown in **Table 1**.

Participant	Gender prejudice score (out of 10)
A	10
B	8
C	9
D	4
E	6

Table 1

(a) Calculate the standard deviation for the gender prejudice score using the data in **Table 1**. Show your working and give your answer to two decimal places.

(4)

SPACE FOR CALCULATIONS

Standard deviation

(b) Calculate the range for the gender prejudice score.

(1)

SPACE FOR CALCULATIONS

Range

(Total for question = 5 marks)

Q3.

Louise is interested to see whether there is a difference between the number of pictures recalled by children with dyslexia and by those who do not have dyslexia. The children have been given a short recall task to see how many of the pictures they can remember out of 20.

Table 2 shows the raw data from the experiment.

Participant number	Number of pictures recalled by children with dyslexia	Number of pictures recalled by children without dyslexia
1	16	11
2	8	9
3	5	7
4	12	17
5	14	4
6	17	3
7	7	9
8	11	11
9	6	6
10	13	12
Range		

Table 2

(a) Calculate the range of scores Louise gathered in both conditions of her study and complete **Table 2** above.

(2)

SPACE FOR CALCULATIONS

(b) Calculate the standard deviation for the number of pictures recalled by children with dyslexia. Show your working and give your answer to two decimal places.

(4)

SPACE FOR CALCULATIONS

Standard deviation

(Total for question = 6 marks)

Q4.

Rajmund investigated the influence of personality on obedience levels. He used a self-report questionnaire where participants rated their authoritarian personality traits and obedience.

The results of Rajmund's investigation are shown in **Table 1** below.

Participant	Authoritarian personality score (out of 20)	Obedience score (out of 20)
A	18	7
B	5	17
C	14	9
D	6	17
E	9	13
F	12	8
G	8	15
H	4	19

Table 1

(a) Calculate the mean for the authoritarian personality scores.

(1)

Mean:

(b) Calculate the mode for the obedience scores.

(1)

Mode:

Participant	Obedience score (out of 20)	$(x - \bar{x})$	$(x - \bar{x})^2$
A	7	-5.29	27.98
B	17	4.71	22.18
C	9	-3.29	10.82
D	17	4.71	22.18
E	13	0.71	0.50
F	8	-4.29	18.40
G	15	2.71	7.34
Total	86	Total	
Mean \bar{x}	12.29		

Table 2

(c) Rajmund decided to use the standard deviation as a measure of dispersion for his data. Calculate the standard deviation for the obedience scores shown in **Table 2**.

You must show your working and give your answer to **two** decimal places.

(3)

Standard Deviation =

(Total for question = 5 marks)

Q5.

'Textisms' and literacy study

Researchers wanted to explore the relationship between children's knowledge of text message abbreviations and their standard of literacy.

The researchers gained informed parental consent for 88 British children aged 10–12 years old to be involved in their research study. They asked the participants to compose a series of text messages when provided with a set of scenarios. This gave a measure of the children's knowledge of text message (SMS) abbreviations called 'textisms'. An example of a 'textism' could be the use of contractions such as 'txt', 'plz', 'hmwrk'.

Subsequently the researchers measured the children's vocabulary scores using a standardised tool called The British Picture Vocabulary Scales II (Dunn, Dunn, Whetton & Burley, 1997).

The researchers found that the ratio of 'textisms' used to total words by the children was positively associated with their vocabulary.

(Source: adapted from Plester et al. (2009))

Table 4 shows the vocabulary scores and the ratio of 'textisms' to words used by the children in one class.

Child	Vocabulary score	Ratio of 'textisms' to words used in the scenarios
A	100	0.34
B	87	0.20
C	105	0.45
D	92	0.28
E	98	0.32
F	107	0.49
G	101	0.38
H	96	0.30
I	114	0.51

Table 4

(a) Calculate the standard deviation for the vocabulary score using the data in **Table 4**. Show your working and give your answer to **two** decimal places.

(4)

Standard deviation

(b) Explain **one** reason for using the standard deviation rather than the range as a measure of dispersion.

(2)

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(c) Explain **one** improvement that could be made to the 'textisms' and literacy study.

(2)

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(Total for question = 8 marks)

Q6.

Gwen conducted an experiment to investigate whether the length of words influences the number of words that could be recalled. She recruited her participants from a Year 11 GCSE Geography class. Gwen created two word lists, each consisting of eight country names.

- List 1: Countries with short names, for example Peru and Iraq.
- List 2: Countries with long names, for example Cambodia and Indonesia.

Both lists were read to all the participants and each time they had to recall as many of the country names as they could. The results of Gwen's experiment are shown in **Table 1**.

Participant	Number of country names recalled correctly from list 1	Number of country names recalled correctly from list 2
A	5	2
B	4	3
C	6	2
D	4	2
E	5	3
F	4	3
G	5	3
H	5	3

Table 1

(a) Calculate the mean number of country names recalled correctly from **list 2**.

You must give your answer to **one** decimal place.

(1)

SPACE FOR CALCULATIONS

Mean

(b) Calculate the mode for the number of country names recalled correctly from **list 2**.

(1)

SPACE FOR CALCULATIONS

Mode

Participant	Number of country names recalled correctly from list 1	$(x - \bar{x})$	$(x - \bar{x})^2$
A	5	0.25	0.06
B	4	-0.75	0.56
C	6	1.25	1.56
D	4	-0.75	0.56
E	5	0.25	0.06
F	4	-0.75	0.56
G	5	0.25	0.06
H	5	0.25	0.06
Total	38	Total	
Mean \bar{x}	4.75		

Table 2

(c) Gwen decided to use the standard deviation as a measure of dispersion for her data.

Calculate the standard deviation for the number of country names recalled correctly from list 1 shown in **Table 2**.

You must show your working and give your answer to **two** decimal places.

(3)

SPACE FOR CALCULATIONS

Standard deviation =

(d) Explain **one** improvement that could be made to Gwen's experiment.

(2)

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Q7.

Elizabeth conducted a laboratory experiment to investigate the impact of brain damage on long-term memory. She showed 16 photographs of named landmarks to participants with brain damage. After 20 minutes, Elizabeth asked the participants to recall the name of each landmark.

The results of Elizabeth's experiment are shown in **Table 2**.

Participant	Number of landmarks recalled correctly
A	3
B	4
C	4

Table 2

(a) Calculate the percentage of landmarks correctly recalled by **Participant C**.

(1)

Percentage

(b) Elizabeth repeated her experiment with a second group of participants who did not have brain damage. She compared the results from the two experiments.

Explain why Elizabeth compared her results from the two experiments.

(2)

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Q8.

Barbara was investigating people's memory in a school classroom. Barbara placed in the classroom everyday classroom objects, such as books, and objects that would not normally be found in a classroom, such as a teapot. She invited participants to look around the classroom and later recall as many objects as they could. She chose to give participants a list of objects so that they could tick the objects they remembered. **Table 2** summarises her results.

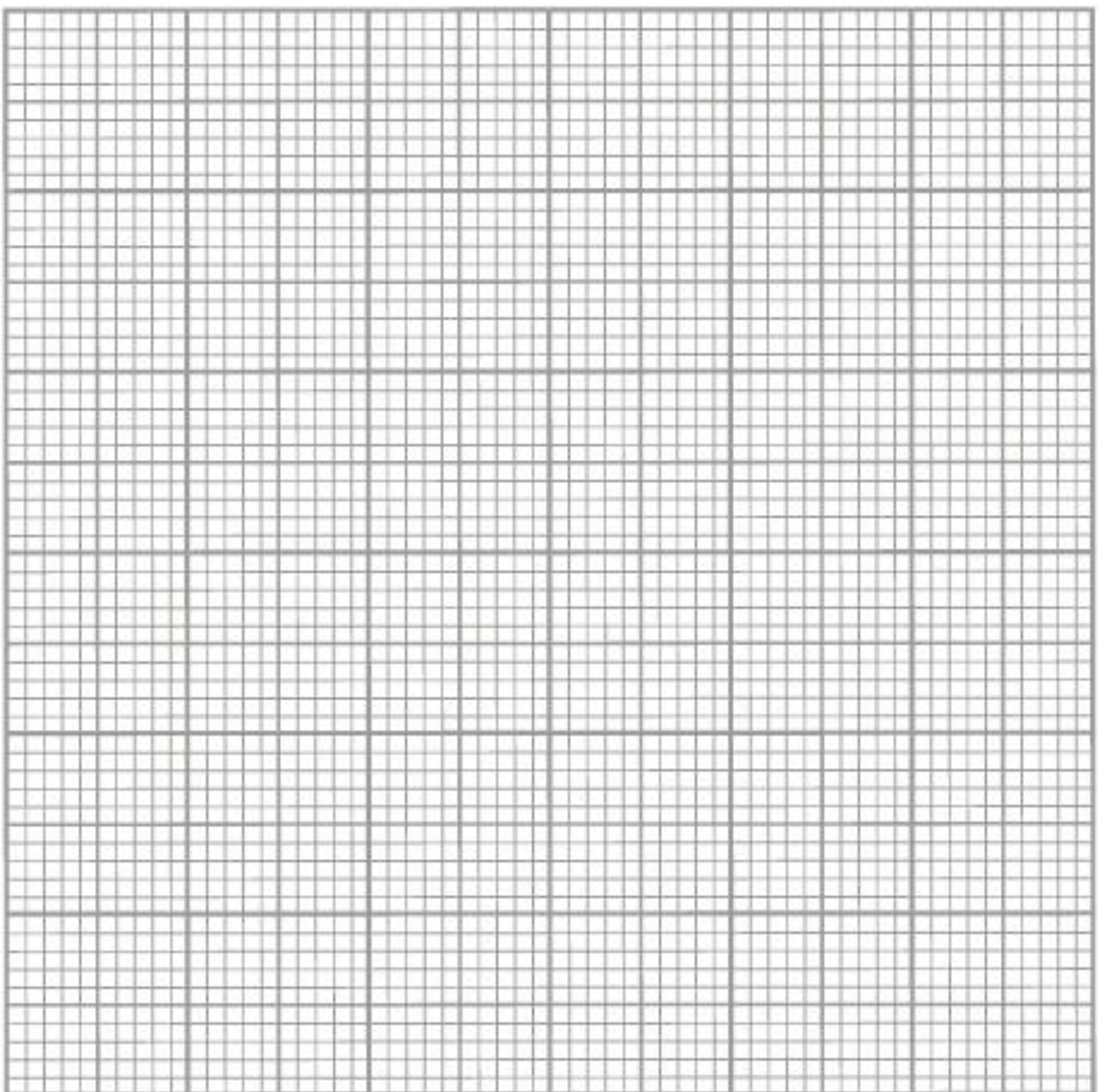
	Everyday classroom objects	Objects not normally found in a classroom
Mean number of objects recalled	20	5

Table 2

(a) Draw an appropriate graph to represent Barbara's results.

(3)

Title:



(b) Analyse Barbara's results to show if they support a prediction that could be made using the theory of reconstructive memory.

(3)

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(c) Explain **one** way in which Barbara could have improved this investigation.

(2)

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(Total for question = 8 marks)

Q9.

George tested the accuracy of memory using a fairy tale story about a princess.

He recruited 27 participants from a local university campus. They read the story once and then recalled the story 10 days later.

George found that participant recall of the fairy tale story was often inaccurate.

(a) Using your knowledge of reconstructive memory, describe why participants in George's study may have inaccurate recall of the fairy tale story.

(2)

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The number of recall errors made by each of the female participants is shown in **Table 3**.

Female participants	Number of recall errors
A	3
D	5
F	8
H	4
K	0
L	1
P	9
R	2
S	7

Table 3

(b) Calculate the range for the number of recall errors made by female participants.

(1)

Range:

(c) Calculate the ratio of male to female participants in George's study.

(1)

Ratio:

(d) Explain **one** improvement that could be made to George's study.

(2)

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The mean number of errors in recall by males and females are shown in **Table 4**.

Mean number of errors in recall for male participants	Mean number of errors in recall for female participants
7.26	4.33

Table 4

(e) Explain **one** conclusion that George could make from the data in **Table 4**.

(2)

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(Total for question = 8 marks)

Q10.

Jake wanted to find out if people obeyed the 30 miles per hour (mph) speed restriction in his local town. He recorded the driving speed of 200 cars on a Saturday afternoon and plotted the data on a frequency distribution curve.

(a) Identify the measure of central tendency shown at data points **A**, **B** and **C** on the frequency distribution curve for Jake's data, shown in **Figure 1**.

(3)

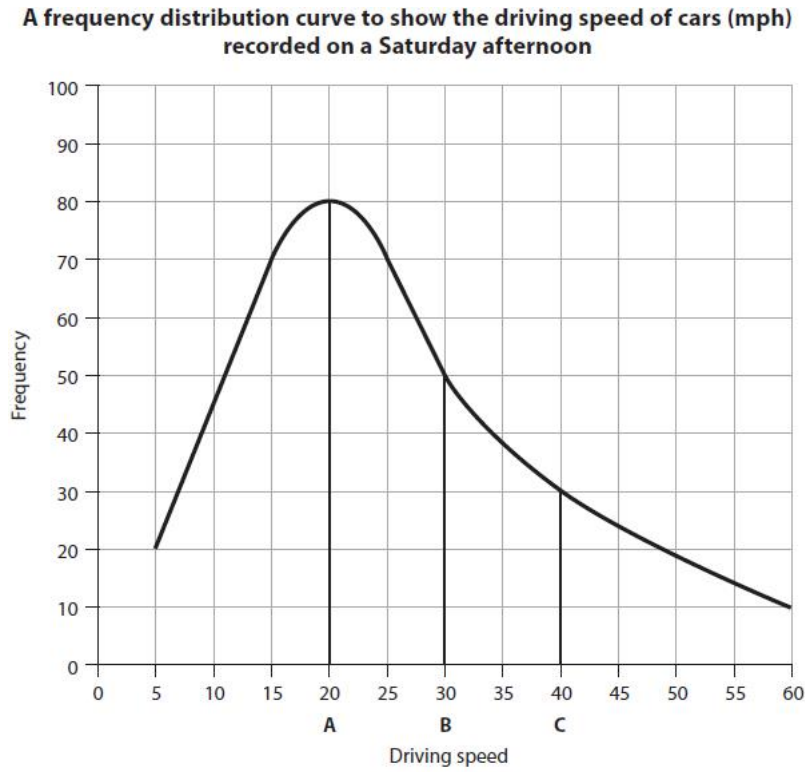


Figure 1

- Measure of central tendency shown at data point **A**
- Measure of central tendency shown at data point **B**
- Measure of central tendency shown at data point **C**

(b) Interpret the data Jake gathered about driving speeds in his local town.

(1)

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(Total for question = 4 marks)

Mark Scheme

Q1.

Question Number	Answer	Mark
(a)	<p style="text-align: center;">AO2 (1 mark)</p> <p>One mark for correct calculation of the median score.</p> <ul style="list-style-type: none"> • 8.5 	(1)
Question Number	Answer	Mark
(b)	<p style="text-align: center;">AO2 (1 mark)</p> <p>One mark for correct calculation of the mean score.</p> <ul style="list-style-type: none"> • 11 	(1)
Question Number	Answer	Mark
(c)	<p style="text-align: center;">AO2 (3 marks)</p> <p>One mark for correct calculation of sum of squared values = 70 One mark for dividing the sum of squared values by 7 (n-1) = 10 One mark for calculating the square root = 3.16 to two decimal places</p>	(3)

Q2.

Question Number	Answer	Mark
(a)	<p style="text-align: center;">AO2 (4 marks)</p> <p>One mark for squaring the values of the gender prejudice scores minus the mean (7.4) for each score, $(x - \bar{x})^2$ 2.6², 0.6², 1.6², -3.4², -1.4²</p> <p>One mark for calculating the sum of these values = 23.2</p> <p>One mark for dividing this by 4 (n-1) = 5.8</p> <p>One mark for calculating the square root = 2.4083189 / 2.41 to two decimal places</p> <p>Look for other reasonable marking points.</p>	(4)
Question Number	Answer	Mark
(b)	<p style="text-align: center;">AO2 (1 mark)</p> <p>One mark for the range for the gender prejudice score.</p> <p>For example:</p> <ul style="list-style-type: none"> • 6 (1). <p>Look for other reasonable marking points.</p>	(1)

Q3.

Question Number	Answer	Mark
(a)	<p style="text-align: center;">AO2 (2 marks)</p> <p>One mark for the range for the pictures recalled by children with dyslexia. One mark for the range for the pictures recalled by children without dyslexia.</p> <p>Range of number of pictures recalled by children with dyslexia</p> <ul style="list-style-type: none"> • 12 <p>Range of number of pictures recalled by children without dyslexia</p> <ul style="list-style-type: none"> • 14 <p>Look for other reasonable marking points.</p>	(2)

Question Number	Answer	Mark
(b)	<p style="text-align: center;">AO2 (4 marks)</p> <p>One mark for squaring the values of the number of pictures recalled by children with dyslexia minus the mean (10.9) for each score, $(x-\bar{x})^2$ 5.1², -2.9², -5.9², 1.1², 3.1², 6.1², -3.9², 0.1², -4.9², 2.1²</p> <p>One mark for calculating the sum of these values = 160.9</p> <p>One mark for dividing this by 9 (n-1) = 17.87777778</p> <p>One mark for calculating the square root = 4.228212125 / 4.23 to two decimal places</p>	(4)

Q4.

Question Number	Answer	Mark
(a)	<p style="text-align: center;">AO2 (1 mark)</p> <p>One mark for correct calculation of the mean score</p> <ul style="list-style-type: none"> • 9.5 <p>Reject all other answers.</p>	(1)

Question Number	Answer	Mark
(b)	<p style="text-align: center;">AO2 (1 mark)</p> <p>One mark for correct calculation of the mode/modal score</p> <ul style="list-style-type: none"> • 17 <p>Reject all other answers.</p>	(1)

Question Number	Answer	Mark
(c)	<p style="text-align: center;">AO2 (3 marks)</p> <p>One mark for correct calculation of sum of squared values = 109.40 One mark for dividing the sum of squared values by 6 (n-1) = 18.23 One mark for calculating the square root = 4.27 to two decimal places</p> <p>Look for other reasonable marking points.</p>	(3)

Q5.

Question Number	Answer	Mark
(a)	<p style="text-align: center;">AO2 (4 marks)</p> <p>One mark for squaring the values of the vocabulary score minus the mean (100) for each score, $(x-\bar{x})^2$ $0^2, -13^2, 5^2, -8^2, -2^2, 7^2, 1^2, -4^2, 14^2$</p> <p>One mark for calculating the sum of these values = 524</p> <p>One mark for dividing this by 8 (n-1) = 65.5</p> <p>One mark for calculating the square root = 8.093207028 / 8.09 to two decimal places</p>	(4)

Question Number	Answer	Mark
(b)	<p style="text-align: center;">AO1 (1 mark), AO3 (1 mark)</p> <p>One mark for identification of a suitable reason (AO1) One mark for justification of the reason (AO3)</p> <p>For example:</p> <ul style="list-style-type: none"> The standard deviation is more sensitive than the range as a measure of dispersion (1) because the standard deviation takes into account all of the scores in a dataset whereas the range only takes the highest and lowest scores into account (1). <p>Look for other reasonable marking points.</p>	(2)

Question Number	Answer	Mark
(c)	<p style="text-align: center;">AO2 (1 mark), AO3 (1 mark)</p> <p>One mark for identification of an improvement in relation to the 'textisms' and literacy study (AO2) One mark for justification of the improvement (AO3)</p> <p>For example:</p> <ul style="list-style-type: none"> They could have measured the number of 'textisms' used in real texts rather than in made up scenarios (1) which would have given a more realistic measure of the number of 'textisms' each child would normally use which would increase the validity of the study (1). <p>Look for other reasonable marking points.</p> <p>Answers must relate to the scenario.</p> <p>Generic answers score 0 marks.</p>	(2)

Q6.

Question Number	Answer	Mark
(a)	<p style="text-align: center;">AO2 (1 mark)</p> <p>One mark for correct calculation of the mean.</p> <ul style="list-style-type: none"> 2.6 <p>Reject all other answers.</p>	(1)

Question Number	Answer	Mark
(b)	<p style="text-align: center;">A02 (1 mark)</p> <p>One mark for correct calculation of the mode.</p> <ul style="list-style-type: none"> • 3 <p>Reject all other answers.</p>	(1)

Question Number	Answer	Mark
(c)	<p style="text-align: center;">A02 (1 mark)</p> <p>One mark for correct calculation of sum of squared values = 3.48 One mark for dividing the sum of squared values by 7 (n-1) = 0.50 One mark for calculating the square root = 0.71 to two decimal places</p> <p>Look for other reasonable marking points.</p>	(3)

Question Number	Answer	Mark
(d)	<p style="text-align: center;">A02 (1 mark), A03 (1 mark)</p> <p>One mark for identification of an improvement to the experiment (A02) One mark for justification of improvement (A03)</p> <p>For example:</p> <ul style="list-style-type: none"> • Gwen could use a more representative group of participants from the whole Year 11 group rather than just one geography class (1) this would make her findings about recalling country names more generalisable to the school population (1). <p>Look for other reasonable marking points.</p> <p>Answers must relate to the scenario.</p> <p>Generic answers score 0 marks.</p>	(2)

Q7.

Question Number	Answer	Mark
(a)	<p style="text-align: center;">A02 (1 mark)</p> <p>One mark for correct answer</p> <p>For example:</p> <ul style="list-style-type: none"> • 25% <p>Reject all other answers.</p>	(1)

Question Number	Answer	Mark
(b)	<p>AO2 (1 mark), AO3 (1 mark)</p> <p>One mark for identification of why the results were compared (AO2). One mark for justification of why (AO3).</p> <p>For example:</p> <ul style="list-style-type: none"> • She can see whether the brain damaged participants recall is different to recall in participants with no brain damage (1). As Elizabeth can use the baseline data to test whether scores from participants with brain damage are significantly different from participants with no brain damage (1). <p>Look for other reasonable marking points.</p> <p>Generic answers score 0 marks.</p>	(2)

Q8.

Question Number	Answer	Mark						
(a)	<p>AO2 (3 marks)</p> <p>One mark for correct/appropriate title, e.g. Title – A graph to show the (mean) number of classroom and non-classroom objects recalled by participants.</p> <p>One mark for correct/appropriate labelling of axes, e.g. Labelling (both axes) – y axis: (mean) number of items recalled, x axis – everyday classroom objects, objects not normally found in a classroom.</p> <p>One mark for correct plots in two bars.</p> <div style="text-align: center;"> <p>A bar graph to show the mean number of classroom and non-classroom objects recalled by participants:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <caption>Data for Bar Graph</caption> <thead> <tr> <th>Category</th> <th>Mean number of items recalled</th> </tr> </thead> <tbody> <tr> <td>Everyday classroom objects</td> <td>20</td> </tr> <tr> <td>Objects not normally found in a classroom</td> <td>5</td> </tr> </tbody> </table> </div>	Category	Mean number of items recalled	Everyday classroom objects	20	Objects not normally found in a classroom	5	(3)
Category	Mean number of items recalled							
Everyday classroom objects	20							
Objects not normally found in a classroom	5							

Question Number	Answer	Mark
(b)	<p>AO2 (1 mark), AO3 (2 marks)</p> <p>One mark for correct prediction using reconstructive memory theory (AO2).</p> <p>Two marks for correct analysis of the figures in support of this prediction (AO3).</p> <p>Example:</p> <ul style="list-style-type: none"> • Reconstructive memory predicts that there should be more of the everyday objects remembered than the unfamiliar ones. These results support this (1). • People recall what they have seen based on an expectation of what is in a classroom rather than actuality (1). • People recall expected objects more than unexpected objects with 20 everyday objects compared to only 5 objects not normally found in a classroom, showing that schemas are used/memory is not like a tape recorder (1). <p>Look for other reasonable marking points.</p>	(3)

Question Number	Answer	Mark
(c)	<p style="text-align: center;">A03 (2 marks)</p> <p>Up to two marks for explaining one way in which the investigation could be improved.</p> <ul style="list-style-type: none"> • Writing on a blank sheet would be better (1), so the method would be a measure of what the participants could recall / as it would mean no memories were missed by the list as the list could not contain all the objects that a participant might think of (1). • Barbara could have used a less familiar object than a tea pot (1) because it is less likely to be part of the classroom schema (more out of place) (1). <p>Look for other reasonable marking points.</p>	(2)

Q9.

Question Number	Answer	Mark
(a)	<p style="text-align: center;">A02 (2 marks)</p> <p>Up to two marks for description in relation to the scenario</p> <p>For example;</p> <ul style="list-style-type: none"> • Participants may have had a prior schema of a fairy tale about princesses (1) which would mean they replaced parts of the story with content from fairy tales they had previously read (1). <p>Look for other reasonable marking points.</p> <p>Generic answers score 0 marks.</p> <p>Answers must relate to the scenario.</p>	(2)

Question Number	Answer	Mark
(b)	<p style="text-align: center;">A02 (1 mark)</p> <p>One mark for correct calculation of the range</p> <ul style="list-style-type: none"> • 9 	(1)

Question Number	Answer	Mark
(c)	<p style="text-align: center;">A02 (1 mark)</p> <p>One mark for correct calculation of the ratio of male to female participants</p> <ul style="list-style-type: none"> • 2:1 	(1)

Question Number	Answer	Mark
(d)	<p style="text-align: center;">A02 (1 mark), A03 (1 mark)</p> <p>One mark for identification of an improvement to the study (A02) One mark for justification of the improvement (A03)</p> <ul style="list-style-type: none"> George could use a larger sample of participants from locations other than the university (1) this would improve the representativeness of the participants to increase generalisability to a wider population (1) <p>Look for other reasonable marking points.</p> <p>Generic answers score 0 marks.</p> <p>Answers must relate to the scenario.</p>	(2)

Question Number	Answer	Mark
(e)	<p style="text-align: center;">A02 (1 mark), A03 (1 mark)</p> <p>One mark for identification of an appropriate conclusion for George's study (A02) One mark for justification of conclusion (A03)</p> <ul style="list-style-type: none"> Females have a more accurate recall for stories than males (1) as females make an average of 2.93 less recall errors than males (1) <p>Look for other reasonable marking points.</p> <p>Generic answers score 0 marks.</p>	(2)

Q10.

Question Number	Answer	Mark
(a)	<p style="text-align: center;">A02 (3 marks)</p> <p>One mark for correct identification of the measure of central tendency shown at each data point.</p> <ul style="list-style-type: none"> A - Mode (1) B - Median (1) C - Mean (1) <p>Look for other reasonable marking points.</p>	(3)

Question Number	Answer	Mark
(b)	<p style="text-align: center;">A02 (1 mark)</p> <p>One mark for accurately interpreting the data in relation to the scenario.</p> <p>For example:</p> <ul style="list-style-type: none"> Most drivers did not exceed the speed restriction of 30mph in Jake's local town (1). <p>Look for other reasonable marking points.</p>	(1)