**Q1.**

A researcher investigated coding in short-term memory using the same participants in both conditions.

•        In the first condition, he read out a list of 10 different sounding words.

•        In the second condition, he read out a list of 10 similar sounding words.

The researcher recorded how many words participants recalled correctly in each condition. The table below shows the results of his study.

**Mean number of words recalled and standard deviations**

|  |  |  |
| --- | --- | --- |
|  | **Different sounding words** | **Similar sounding words** |
| Mean | 7.1 | 4.6 |
| Standard deviation | 1.9 | 0.6 |

(a)     What do the means in the table suggest about STM coding? Justify your answer.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(2)**

(b)     What do the standard deviation values in the table suggest? Justify your answer.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(2)**

(c)     Explain how using counterbalancing might improve the design of the study**.**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(2)**

**(Total 6 marks)**

**Q2.**

A psychologist decided to design an experiment to test the effects of recreational screen time on children’s academic performance.

The psychologist randomly selected four schools from all the primary schools in her county to take part in the experiment involving Year 5 pupils. Three of the four schools agreed to take part. In total, there were 58 pupils whose parents consented for them to participate. The 58 pupils were then randomly allocated to **Group A** or **Group B**.

For the two-week period of the experiment, pupils in **Group A** had no recreational screen time. Pupils in **Group B** were allowed unrestricted recreational screen time. At the end of the experiment all pupils completed a 45-minute class test, to achieve a test score.

(a)  Complete **Table 1** by ticking the statement that best describes the population and the sample in the psychologist’s experiment. Place **one** tick in each column.

|  |  |  |
| --- | --- | --- |
| **Table 1** | | |
|  | **Population** | **Sample** |
| All the pupils in the selected four schools. |  |  |
| All the Year 5 pupils across the world. |  |  |
| All the Year 5 pupils in the county. |  |  |
| All the Year 5 pupils in the selected three schools. |  |  |
| All the 58 Year 5 pupils with parental consent in the selected three schools. |  |  |

**(2)**

(b)  Briefly explain why a directional hypothesis would be most suitable for this experiment.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(c)  Write an appropriate hypothesis for this experiment.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(3)**

The results obtained from the experiment are summarised in **Table 2**.

|  |  |  |
| --- | --- | --- |
| **Table 2: Descriptive statistics for the test performance scores for Group A and Group B** | | |
|  | **Group A (no screen time)** | **Group B (unrestricted screen time)** |
| Mean | 73.6 | 66.3 |
| Median | 74.0 | 58.0 |
| Mode | 74.0 | 44.0 |
| Standard deviation | 13.2 | 25.1 |

(d)  Using the data in **Table 2**, explain how the distribution of scores in **Group A** differs from the distribution of scores in **Group B**.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(4)**

(e)  What do the mean and standard deviation values in **Table 2** suggest about the effect of the recreational screen time on test performance? Justify your answer.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(4)**

(g)  One criticism of the study is that the pupils were not matched on their typical recreational screen time.

Explain how the psychologist could have matched pupils on their typical recreational screen time across the experimental conditions.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(4)**

(h)  Identify **one** other variable for which the psychologist could have matched the pupils. Explain how this might have affected the test performance if it was not controlled.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(2)**

**(Total 27 marks)**

Mark schemes

**Q1.**

(a)  **[AO2 = 1 AO3 = 1]**

**1 mark** for interpreting what the mean memory span values suggest about coding in short-term memory: coding in short-term memory is based on sound (acoustic).

Accept alternative wording.

**Plus**

**1 mark** for an accurate justification about the difference in the mean scores: mean number of words recalled is smaller when words are similar sounding than when they are different.

Accept alternative wording.

**0 marks** for just stating the data from the table.

Justifications are not creditworthy in isolation.

**2**

(b)  **[AO2 = 1 AO3 = 1]**

**1 mark** for an accurate comment about what the standard deviation values suggest: there was more variability in scores in the different sounding condition.

Accept alternative wording (there was more consistency in scores in the similar sounding condition).

**Plus**

**1 mark** for an accurate justification about the difference in the standard deviations: standard deviation is greater in the different sounding condition than in the similar sounding condition.

Accept alternative wording (standard deviation is smaller in the similar sounding condition).

**0 marks** for just stating the data from the table.

Justifications are not creditworthy in isolation.

**2**

(c)  **[AO3 = 2]**

**2 marks** for a clear and coherent explanation of how using counterbalancing might improve the design of the study.

**1 mark** for a muddled/limited explanation.

**Relevant points:**

•   addresses the problem of order effects, eg practice, may have occurred in the repeated measures design/because participants took part in both conditions

•   by having half the participants do the conditions in a different order, any order effects affect both conditions equally.

Accept other possible explanations.

**2**

**[6]**

**Q2.**

(a)  **[AO2 = 2]**

|  |  |  |
| --- | --- | --- |
|  | **Population** | **Sample** |
| All the pupils in the selected four schools. |  |  |
| All the Year 5 pupils across the world. |  |  |
| All the Year 5 pupils in the county. | ✔ |  |
| All the Year 5 pupils in the selected three schools. |  |  |
| All the 58 Year 5 pupils with parental consent in the selected three schools. |  | ✔ |

**2**

(b)  **[AO2 = 1]**

There is past research indicating that recreational screen time has a detrimental effect on academic performance (or similar).

**1**

(c)  **[AO2 = 3]**

**3 marks** for an appropriate and clearly stated operationalised directional hypothesis:

‘Students (who have a two-week period) without recreational screen time (Group A) will have higher class test scores than students (who have a two-week period) with unrestricted/unlimited recreational screen time (Group B).’

Accept alternative wording.

**2 marks** for a directional statement with the IV and the DV operationalised but that lacks clarity OR a clear directional statement which has only one variable operationalised, eg Group A and Group B are used to describe conditions of the IV.

**1 mark** for a muddled directional statement with the IV and DV present and that "only" "has" one variable operationalised, or for a clear directional statement with the IV and DV but neither is fully operationalised.

**0 marks** for expressions of aim/questions/correlational/non-directional hypotheses or statements with only one condition of the IV present.

**3**

(d)  **[AO2 = 4]**

Award **1 mark** for each of the following points:

•   the data in Group A is symmetrical/normally distributed

•   because the mean (73.6) is approximately equal to the mode/median (74)

•   the data in Group B is positively skewed

•   because the mean (66.3) is greater than the mode (44)/median (58).

**Note**: credit can be given if this information is provided in diagrams.

**4**

(e)  **[AO2 = 2 AO3 = 2]**

**Mean:**

**1 mark** for suggestion – recreational screen time has a negative impact on test performance.

Accept alternative wording.

**Plus**

**1 mark** for justification – mean test performance is higher when there is no recreational screen time (Group A) than when recreational screen time is unrestricted (Group B).

Accept alternative wording.

**Standard deviation:**

**1 mark** for a suggestion – the impact of recreational screen time on test performance is not consistent.

Accept alternative wording.

**Plus**

**1 mark** for a justification – there was a wider variation of test performances/higher standard deviation in Group B compared to Group A.

Accept alternative wording.

**Note**: **0 marks** for just stating the data from the table.

**Note:** justifications are not creditworthy in isolation.

**4**

(f)  **[AO2 = 7]**

**1 mark** for Mann-Whitney (OR unrelated t-test, if this does not contradict data type).

**Plus**

For **each** of the following bullet points award:

**2 marks** for a clear and coherent reason linked to the study.

**1 mark** for a limited/partial reason.

**Possible content:**

•   it is testing for a difference **–** having no recreational screen time on exam performance as opposed to having unlimited recreational screen time

•   it uses an independent/unrelated design –the pupils either had no recreational screen time or unlimited recreational screen time

•   data is ordinal – the difference between each test score is not fixed **OR** data is assumed to be nonparametric as the data in Group B is skewed (OR data is interval – the difference between test scores is fixed)

**Note**: accept an alternative appropriate statistical test if correct justification of the data is given.

**Note**: appropriate reason can be credited even if an incorrect test is named or no test is given.

**Note**: where more than three reasons are given, only the first three should be marked.

**7**

(g)  **[AO2 = 4]**

Award **1 mark** for **each** bullet point given below:

•   the psychologist could use a questionnaire/interview/ask parents to report/pupils to self-report

•   examples of questions given/data obtained on average/daily recreational screen time use

•   pupils with similar recreational screen time use would be paired

•   one pupil from each pair would be (randomly) placed in Group A and the other in Group B.

Accept alternative wording.

**4**

(h)  **[AO2 = 2]**

**1 mark** for a suggestion of an appropriate variable, eg academic performance, speed of learning, concentration in class etc.

**Plus**

**1 mark** for an explanation of how it might relate to test performance.

**2**

**[27]**