

Eton College King's Scholarship Examination 2024

SCIENCE 2 (Data Analysis)

(30 minutes)

Candidate Number:.....

Please write your candidate number on EVERY sheet.

Please answer on the paper in the spaces provided.

You must attempt ALL questions.

The maximum mark for each question or part of a question is shown in square brackets.

Calculators are allowed. In questions involving calculations, all your working must be shown.

Total Marks Available: 30

ADDITIONAL MATERIALS: INSERT

For examiners' use only:

1	2	Total [30]

Do not turn over until told to do so.

Rainfall patterns have changed in recent years due to the effects of climate change. Understanding the impact these changes are having on ecology is a scientific problem currently being investigated. As our planet contends with new shifts caused by climate change, exploring the correlation between fluctuating rainfall patterns and the effect on ecosystems and biodiversity becomes more urgent. Notably, data suggest a concerning decline in butterfly populations, which serve as an indicator of environmental disruption.

1. Measuring rainfall serves as a fundamental method to quantify precipitation patterns and understand seasonal variations. The table below shows the rainfall per month in the years 2020 and 2021.

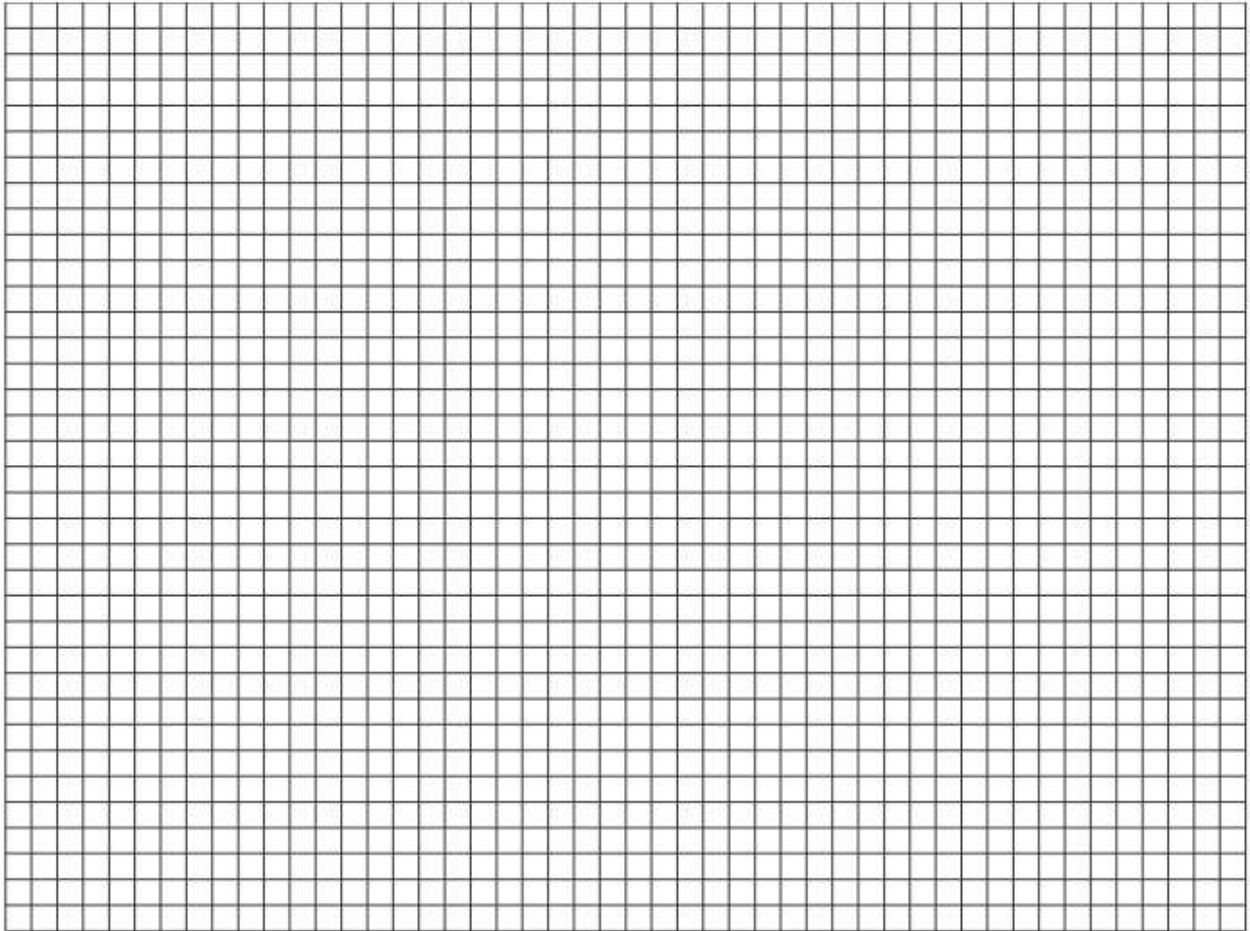
Month	Rainfall in 2020 / mm	Rainfall in 2021 / mm
Jan	121	140
Feb	214	105
March	79	87
April	30	21
May	33	121
Jun	108	45
July	96	75
Aug	122	67
Sept	77	82
Oct	183	168
Nov	105	81
Dec	167	114
Total rainfall		
Range		

Fig 1. A table showing rainfall in 2020 and 2021 in the UK.

- (a) Calculate the total rainfall for 2020 and 2021. Write your answers in the table above. [1]
- (b) Calculate the range for 2020 and 2021. Write your answers in the table above. [1]
- (c) Calculate the percentage change in the total rainfall from 2020 to 2021.

Percentage change: _____ [2]

(d) Plot the data from Figure 1 in a suitable graph using the grid below. [5]



(e) State which month shows the biggest change in rainfall from 2020 to 2021.

_____ [1]

(f) Identify two trends that can be observed from your graph.

_____ [2]

This part of the question focuses on butterfly numbers from **2021**.

Butterflies in the UK, monitored by the UK Butterfly Monitoring Scheme, serve as crucial environmental indicators. By investigating butterfly populations the data generated can be used to evaluate climate change impacts and governmental biodiversity conservation efforts.

2. A hypothesis is an educated guess or prediction made by a scientist before conducting an experiment or investigation. It is a statement that suggests an expected outcome based on available knowledge or observations and can be tested through experiments or further observations to see if it is supported or not.

- (a) Write a hypothesis for the investigation to analyse the impact of changing rainfall on butterfly populations.

[1]

Below are the data for five species of butterfly. Images of the 5 species analysed are shown on the insert.

Butterfly species	Number of sites monitored	% change in abundance from 2020 to 2021
Small White	2585	-35
Criptic Wood White	15	-47
Chalk Hill Blue	303	48
Common Blue	2253	-9
Holly Blue	1911	-50

Fig 1. A table showing changes in abundance of five different butterfly species.

- (b) Why has the data been presented as percentage change?

[2]

- (c) Suggest the unit that the raw data may have been collected in.

[2]

The majority of sites are investigated using butterfly transects, a method also known as 'Pollard walks'. The standard transect method involves weekly butterfly counts along fixed routes through the season made under strict criteria.

(d) Suggest what equipment might be needed in order to gather the data.

[1]

(e) Suggest which 'strict criteria' should be applied to the sampling.

[3]

(f) One scientist concluded that '**decreasing rainfall caused a decrease in butterfly populations**'. Discuss this conclusion.

[4]

Citizen science in wildlife surveys, such as butterfly counts, involves the work of volunteers. Often, these are members of the public contributing to scientific research by actively participating in data collection and observation of wildlife in their natural habitats. This could include local woodland or the volunteers' gardens. The insert is an example of an identification chart that the volunteers are provided with.

(g) Evaluate the use of citizen science to collect data in this study.

[3]

Ecologists are now using advanced technology like Artificial Intelligence (AI) to monitor wildlife more effectively. By analysing camera footage, AI helps identify and track various species. Programs like Google DeepMind can predict ('nowcast') weather patterns within 2-6 hour windows.

(h) Suggest why using AI might be more beneficial than citizen science in monitoring butterfly numbers.

[2]

END OF PAPER