

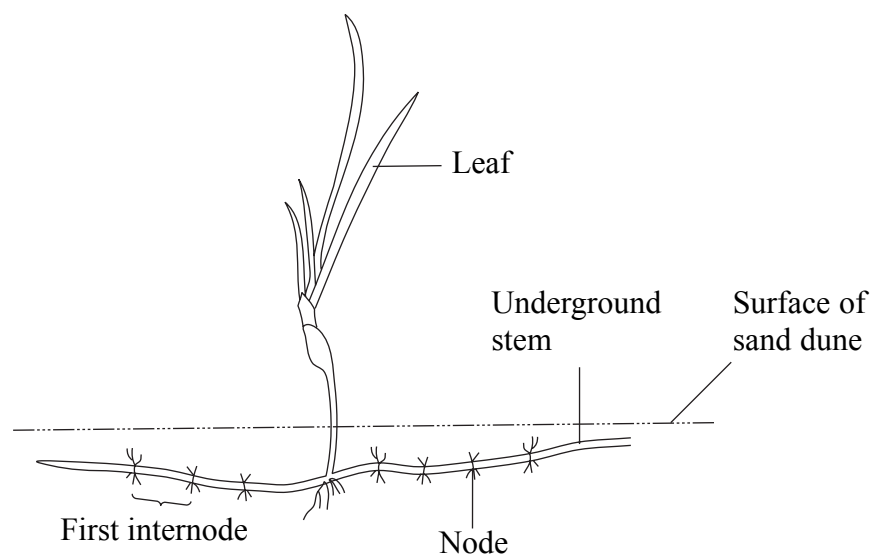
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Answer BOTH questions.

Write your answers in the spaces provided.

1. Marram grass (*Ammophila arenaria*) is a grass-like plant which grows in the soft sand of dunes close to the sea. It grows through the sand by means of horizontal underground stems. These stems have swellings at intervals which are called nodes. The distance between two nodes is called an internode as shown in the drawing below.



Sand dunes are affected by strong winds which move the sand and bury the stems of Marram grass. Where the effect of wind is stronger the stems are buried deeper and they grow faster, making the internodes longer.

A student formed the hypothesis that the first internodes on the stems of Marram grass would be longer on the windward (exposed) side of dunes, compared to those on the sheltered side.

To test this hypothesis she measured the length of the first internodes on underground stems from carefully controlled samples on each side of two dunes.



An extract from her field note book is shown below.

First internode length in mm

Dune 1

Sheltered

70, 36, 90, 10, 50, 90, 40, 52

Windward

80, 107, 82, 97, 70, 74, 115, 60

Dune 2

Sheltered

41, 84, 29, 31, 37, 56, 41, 62

Windward

108, 110, 79, 71, 50, 92, 82, 61

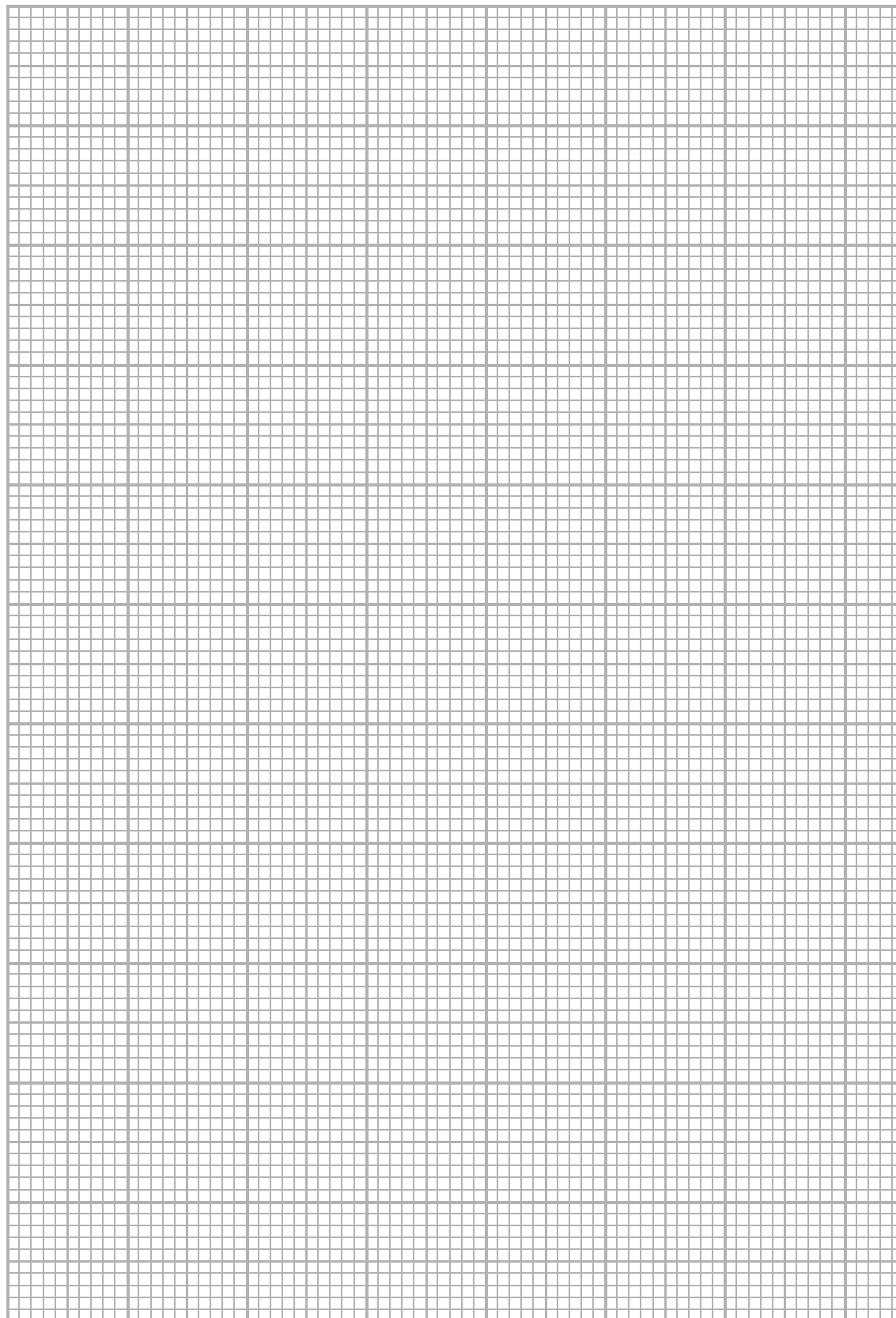
- (a) Prepare a table of raw data and organise it in such a way that the distribution of size classes of first internode lengths on the windward side of the dune can be compared with those on the sheltered side.

(3)



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(b) Use the data in your table to present the information in a suitable graphical form.



(4)



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(c) Comment on the variability shown by these data.

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(1)

(d) The student applied a t-test to her data in order to test this hypothesis.

She calculated the value of t to be 4.09.

The table below shows the critical values of t with 30 degrees of freedom at different significance levels.

Significance level (p)	0.2	0.1	0.05	0.02	0.01	0.001
Critical value of t	1.31	1.70	2.04	2.46	2.75	3.65

What conclusions can be drawn from this investigation? Use the information provided to explain your answer.

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(3)

(Total 11 marks)

Q1

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