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| **Topic 4: Statistics and Probability** | **Chi-Square** | |
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| 1. A study was done to determine whether the amount of sleep a student gets affects their GPA. A random sample of high school seniors was taken in the Unites States. The results are in the following table. | |  |
| |  |  |  |  | | --- | --- | --- | --- | |  | **GPA < 2.0** | **2.0 ≤ GPA < 3.0** | **3.0 ≤ GPA ≤ 4.0** | | **Hours of Sleep < 7** | 10 | 12 | 6 | | **7 ≤ Hours of Sleep < 8** | 7 | 14 | 18 | | **8 ≤ Hours of Sleep** | 9 | 12 | 25 | | | |
| A test was performed at the 1% significance level. The critical value for this test is 13.77.   1. State the null hypothesis. 2. Write down the degrees of freedom. 3. Write down:    1. The statistic.    2. The associated p-value. 4. State, giving a reason, whether the null hypothesis should be accepted.   Mark scheme:   1. Ho: The GPA of a high school senior is independent of the number of hours of sleep they receive. 2. Degrees of Freedom: 3. p-value 4. Method 1:     Fail to reject the null hypothesis   Method 2: p-value significance level  Enough evidence to support null hypothesis | | (1 mark)  (1 mark)  (1 mark)  (1 mark)  (2 marks)  (A1)  (A1)   (A1)  (A1)    (R1)  (A1)  (R1) (A1) |
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