

A scientist is investigating whether the ability to remember depends on age. A random sample of 150 students in different age groups is chosen. Each student is shown a set of 20 objects for thirty seconds and then asked to list as many as they can remember. The students are graded *A* or *B* according to how many objects they remembered correctly: grade *A* for 16 or more correct and grade *B* for fewer than 16 correct. The results are shown in the table.

|                | Age of students |             |             |
|----------------|-----------------|-------------|-------------|
|                | 11–12 years     | 13–14 years | 15–16 years |
| Grade <i>A</i> | 25              | 16          | 19          |
| Grade <i>B</i> | 28              | 45          | 17          |

- (a) Carry out a  $\chi^2$ -test at the 2.5% significance level to test whether grade is independent of age of student. [7]

The scientist decides instead to use three grades: grade *A* for 16 or more correct, grade *B* for 10 to 15 correct and grade *C* for fewer than 10 correct. The results are shown in the following table.

|                | Age of students |             |             |
|----------------|-----------------|-------------|-------------|
|                | 11–12 years     | 13–14 years | 15–16 years |
| Grade <i>A</i> | 25              | 16          | 19          |
| Grade <i>B</i> | 12              | 27          | 11          |
| Grade <i>C</i> | 16              | 18          | 6           |

With this second set of data, the test statistic is calculated as 10.91.

- (b) Complete the  $\chi^2$ -test at the 2.5% significance level for this second set of data. [2]
- (c) State, with a reason, whether you would prefer to use the result from part (a) or part (b) to investigate whether the ability to remember depends on age. [1]