

- 16 In the first year of a course, an A-level student, Aaishah, has a mathematics test each week. The night before each test she revises for t hours. Over the course of the year she realises that her percentage mark for a test, p , may be modelled by the following formula, where A , B and C are constants.

$$p = A - B(t - C)^2$$

- Aaishah finds that, however much she revises, her maximum mark is achieved when she does 2 hours revision. This maximum mark is 62.
 - Aaishah had a mark of 22 when she didn't spend any time revising.
- (i) Find the values of A , B and C . [3]
- (ii) According to the model, if Aaishah revises for 45 minutes on the night before the test, what mark will she achieve? [2]
- (iii) What is the maximum amount of time that Aaishah could have spent revising for the model to work? [2]

In an attempt to improve her marks Aaishah now works through problems for a total of t hours over the three nights before the test. After taking a number of tests, she proposes the following new formula for p .

$$p = 22 + 68(1 - e^{-0.8t})$$

For the next three tests she recorded the data in Fig. 16.

t	1	3	5
p	59	84	89

Fig. 16

- (iv) Verify that the data is consistent with the new formula. [2]
- (v) Aaishah's tutor advises her to spend a minimum of twelve hours working through problems in future. Determine whether or not this is good advice. [2]