

## IN OR OUT?

### 1. OVERVIEW

In this case, the pupils' initial task is to construct a simple mathematical model of the situation to help them decide whether or not the umpire made the correct decision in the situation shown in the photograph. Pupils then generalise their findings and apply their model to other situations. As different aspects of the modelling are explored, the skills and thinking required gradually emerge as essential tools. This case is designed to be used to explore a range of mathematical areas and concepts and would ideally not be incorporated into a single topic. The use of several topics in the case including 'handling data', 'algebra' and 'measurement' means that the case could be used following these topics as consolidation of the basic skills. Furthermore, this case will deepen pupils' understanding of the application of these skills in the real world and require them to integrate multiple skills, previously only studied in discrete topics.

**To the pupil:** "In an Ashes test match over forty years ago a batsman ran to make his crease. As he ran the wicketkeeper whipped off the bails. The umpire said the batsman was "IN", but at the time the decision was very controversial! In this case study you will use mathematics to help you decide "*Was the batsman IN or OUT?*"

### 2. MATHEMATICAL CONTENT

The **mathematical activities** involved in this case are of three principle types: **modelling and explaining** (pupils prepare models to make predictions); **exploring and discovering relationships** (pupils make predictions based on evidence from the photo); **interpreting and estimating** (pupils identify areas of error for each variable and discuss their predictions in light of these errors). The **mathematical content** includes: **numeracy and mathematics** (accurate calculation, measurement and units); **space, shape and measure** (use of several movement formulae, calculations of distance, error measurements); **handling data** (collection of primary data, interpretation of data); **using and applying mathematics and thinking skills** (justifying, generalising); **ICT** (spreadsheets). Pupils should be competent in the use of basic algebra and formulae, including substitution, before starting this case. A working understanding of spreadsheets would also be an advantage.

### 3. ORGANISATION AND PEDAGOGY

The Mathematics and thinking required in this case becomes complex and is recommended for pupils in level 6, or high ability pupils in level 5, especially those highly capable in algebra and handling data. During each lesson **class work** will involve a combination of class discussion, group and individual work. Field work during the case may be used to assist pupils to develop feel for the game and collect primary data for use in developing their models. While traditional requirements of a classroom teacher, such as developing understanding and knowledge in pupils, apply to this case, the **role of the teacher** has some unique aspects in a case such as this. These include setting the broad context of the case and ensuring that pupils understand the place of each activity within this context, guiding the class to generate models by posing questions and carefully running class discussions, asking pupils to justify and explaining counter-intuitive scenarios. To assist teachers in handling the unique teaching and learning issues identified within this case, specific advice is offered at key stages through the case.

Homework is provided as part of each lesson plan. Homework for each lesson is mainly designed to develop necessary skills and knowledge and ask pupils to draw together and make decisions about the material covered through the lesson. This is often used as a starting point for the next lesson.

### 4. RESOURCES

**Case materials** are provided from a website which can be loaded onto the school intranet. Each lesson contains lesson outlines and detailed lesson descriptions. The website also contains links to all materials required including photos, video clips and required cricket knowledge. Other support for teachers include specific advice on each activity, sample outcomes for activities, advice for extending advanced pupils as well as vignettes written by trialling teachers that raise relevant issues of teaching and learning. ICT requirements during the case include data projectors, Windows Media Player and spreadsheets. Teachers may also choose to prepare to engage pupils in a game of cricket prior to or during the case. Pupils only require standard equipment including rulers and calculators but should keep a log book recording their thoughts and calculations during this case. Very little printed material is required.