Decimal Places: Photofinish

Key Learning Content

The film uses athletic events as the context for exploring the need for extreme accuracy in measurement. It tells the story of a race between three British sprinters in 1994 where the difference between first and second place was less than one hundredth of a second.

Familiarity with decimal notation and the metric system would be useful prior to watching the film.

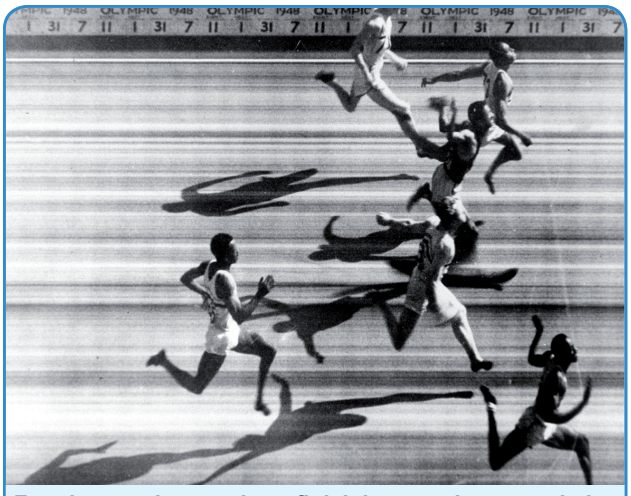
Core Outcomes

Learning Points

- Be able to use decimal notation.
- Be able to order decimals.
- Be able to carry out calculations using standard units of length and time.

Suggested Activities

- Take decimal numbers of different lengths and order them from smallest to largest.
- Work out the difference between decimals by subtraction.



For short sprints, a photo finish is sometimes needed to determine who crossed the finishing line first.

Extension Outcomes

Learning Points

- Be able to interpret scales on a range of measuring instruments.
- Be able to make sensible estimates of a range of measures.
- Be able to round to a given number of decimal places or significant figures.

Suggested Activities

- Get students to record how long it takes for an object dropped from a certain height to hit the ground, using firstly a stopwatch and then the clock on a mobile phone, and compare readings.
- Interpret the accuracy of measurements given to a specified number of decimal places or significant figures.
- Work out how far a sprinter travels in centimetres in every hundredth of a second.

Related Films

To use before the lesson plan:

Decimals: Decimal Day	This film describes the changes to British currency that happened in 1971, when pounds, shillings and pennies were replaced by the decimal system of 100 pence in the pound.

To use after the lesson plan:

How Long Is a Metre?	This film relates the history of this standard measurement and of how it has come to be precisely defined.
Heptathlon	This film explains how points are calculated in the heptathlon athletics event so that, for example, a long throw in the javelin can be compared with a fast time in the 200m sprint.

Guide Lesson Plan

Introduction

Ask how quickly the students think they could move from one side of the classroom to the other. Then ask how long it would take an Olympic sprinter to cover the distance. Assuming the room is about five metres wide, tell the students that a sprinter could cover the distance in less than half a second.

Show Film

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Main Activity

Foundation

Give students the times of sprinters in a major athletics event and ask them to work out the degree of accuracy to which the times are given. Then get them to work out the minimum and maximum time differences between each sprinter, given this level of accuracy. Do the same for a middle distance track event and a marathon. Ask students to work out the degree of measurement accuracy for each event as a percentage of the winning time.

Advanced

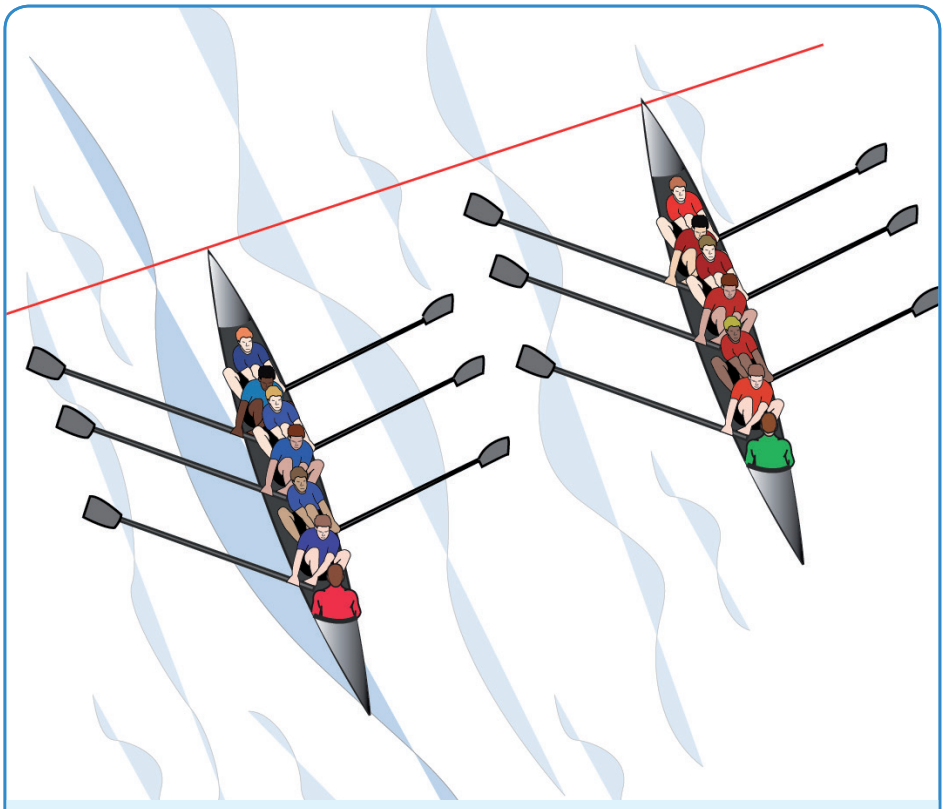
Carry out an experiment with the students to measure how long it takes a ball to fall a given distance (dropped from a window or balcony to the ground). For each drop of the ball, get students to measure the time using different devices, e.g. a sports stopwatch, a mobile phone stopwatch, a watch with second hand, a digital watch showing tenths of a second. Collect and compare the results and discuss the level of accuracy that could reasonably be claimed for the measured time.

Extension Activity

Give students stopwatches and get them to click them on and off as fast as they can. Record the times taken to complete a switch-on-switch-off sequence. Compare the times of different students. Then consider the accuracy of the measurements and agree the minimum recorded time difference necessary to be certain that one student was indeed faster than another.

Optional Extra

In recent research carried out, scientists at CERN, the European nuclear research facility in Geneva, suggested that neutrinos had been detected travelling faster than the speed of light. Research this event, and find out the time taken and distance travelled for the neutrinos. What level of measurement accuracy was required to make the claim?



A photo finish can reveal only a hundredth of a second between competitors in a race.