

Chapter notes: 18 Probability distributions

Overview

The focus in this chapter is on predicting statistics when probabilities are known. Two common distributions – the binomial and the Poisson – are introduced. It needs approximately eight hours of teaching time.

Introductory problem

The introductory problem should get students thinking about the idea of expected average, and whether this is actually related to the most likely outcome. In this example, the expected average is infinite, but the most likely outcome is that you win £2. The ‘Theory of knowledge issues’ box at the end of the section (page 574) invites students to think about consequences of this. The worked solution is given at the end of the chapter, page 574; the idea being that students should be able to answer the question using the methods covered in the chapter.

18A Random variables, p546

There are no specific teacher notes for this section.

18B Expectation of a discrete random variable, p550

Hints for grade 7 questions:

9. (a) Probabilities can be found by drawing a tree diagram.

18C The binomial distribution, p553

It is difficult to explain the formula for the binomial distribution without interpreting the binomial coefficients in terms of counting. However, it might be interesting to link to the binomial expansion to show that the sum of all the binomial probabilities totals one. The emphasis should be on using technology to find binomial probabilities.

18D The normal distribution, p562

The normal distribution tables have been removed from the formula book, so all calculations need to be done on the calculator. Hence standardising is only required when μ or σ are unknown. The worked examples in this section illustrate the amount of working that needs to be shown.

The Z -score still needs to be understood as a measure of how ‘unusual’ a value is. Encourage students to discover the ‘68–95–99.7% rule’ for the amount of data within 1, 2 and 3 standard deviations of the mean; some may already be familiar with it from Biology or Geography.

The ‘From another perspective’ boxes on pages 563 and 566 could generate discussion about how technology has changed the way we do and learn mathematics.

Hints for grade 7 questions:

11. (b) This involves conditional probability.
12. This combines normal and binomial distributions.

18E The inverse normal distribution, p569

Hints for the grade 7 questions:

8. This is asking for $P(-3 < Z < 3)$.
9. (b) You need to calculate the probability that a grain of sand is less than 1 mm across.