

Chapter notes: 2 Exponents and logarithms

Overview

We have placed this chapter early in the book since it is applied in so many other contexts. It also provides a sufficient enough breadth of functions that a more interesting study can be made of functions in general. We would recommend approximately six hours of teaching time.

Introductory problem

The purpose of the introductory problem is to highlight that in some situations the unknown is in the power, and for many students they will not have the algebraic tools to solve such a problem. It might be useful to get them to estimate the solution to highlight that people often have very poor intuition when dealing with exponentially growing or decaying situations. The worked solution is given at the end of the chapter, page 68; the idea being that students should be able to answer the question using the methods covered in the chapter.

2A Laws of exponents, p34

For many students it will be possible to skip this section, although some of the algebraic practice in the questions will be useful.

For students interested in the 0^0 TOK issue raised in the ‘Theory of knowledge issues’ box on page 35, you might like to get them to use their calculator to try $0.1^{0.1}$, $0.01^{0.01}$, $0.001^{0.001}$... i.e. 0^0 defined as $\lim_{x \rightarrow 0} x^x$. Then contrast this with $\lim_{x \rightarrow \infty} (2^{-x})^{\frac{1}{x}}$.

Hints for the grade 7 questions:

16. Use the fact that $2^{x+1} = 2 \times 2^x$.
17. Split 6^{x+1} into $6 \times 3^x \times 2^x$.
18. Write both sides with 2 as a base.

2B Exponential functions, p43

The syllabus from 2014 will have an increased emphasis on modelling and applications in examination questions. Question 3 (d) exemplifies a new type of question that is likely to be asked.

2C The number e, p49

Question 2 illustrates the dangers of using decimal approximations to draw mathematical conclusions.

2D Introduction to logarithms, p51

An alternative Self-discovery worksheet: ‘An introduction to logarithms’ can be found on the CD-ROM.

Hints for the grade 7 questions:

13. You can interpret the information as meaning that the Richter scale is the base 10 logarithm of the strength of the earthquake.

2E Laws of logarithms, p56

The derivation of these rules can be found in Fill-in proof sheet 2: 'Proving log rules' on the CD-ROM.

Hints for the grade 7 questions:

8. Write as a single logarithm and simplify the resulting fraction.
9. Use the change of base formula.
10. Use the change of base formula.

2F Graphs of logarithms, p61

There are no specific teacher notes for this section.

2G Solving exponential equations, p62

Hints for the grade 7 questions:

7. Take logs of both sides first.
8. Take logs of both sides first.
9. The given equation can only be solved graphically. This is a common trick in IB examinations.