

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 54; the idea being that students should be able to answer the question using the methods covered in the chapter.

2A Laws of exponents, p28

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 29, 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:

11. Take out the common factor of 50 from the power and use a rule of exponents.
12. Write both sides with 2 as the base and get all terms with x on one side.

2B Exponential functions, p33

The syllabus from 2014 will have an increased emphasis on modelling and applications in examination questions. Question 4 (d) exemplifies a new type of question that is likely to be asked.

2C The value e , p39

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

2D Introducing logarithms, p40

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, p44

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:

7. Write the far right expression solely in terms of one variable.
8. Write as a single logarithm and simplify the resulting fraction.
9. Use the change of base rule to get all logarithms to the same base.

2F Graphs of logarithms, p49

Question 2 highlights that the log rules in section 2E were only true when both domains were valid.

2G Solving exponential equations, p50

The answer to the question posed in the 'From another perspective' box on inequalities, on page 51, is that the operation needs to be strictly increasing to guarantee that the inequality does not change.

Hints for the grade 7 questions:

8. Set up an exponential model from the given information.
9. The given equation can only be solved graphically. This is a common trick in IB examinations.