

## Indices

**What you should know**

How to use index notation: e.g.  $10^2 = 100$ .

The laws of indices:  $x^a \times x^b = x^{a+b}$ ,  $x^a \div x^b = x^{a-b}$  and  $(x^a)^b = x^{ab}$ .

**New idea**

Logarithms, or logs, are a type of mathematical function. Mathematicians say  $\log_{10} x$  as 'log to the base ten of  $x$ ' and often just write this as  $\log x$ . Your calculator should have a log button.

**Task: Logarithms**

- Use the log button on your calculator to investigate the log function.  
Find the log of some numbers. Here are some good ones to try.  

log 100	log 1000	log 10	log 1	log 2	log 3
log 20	log 242	log 2420	log 2.42	log (-10)	log 0.1

You should find the log of some other numbers as well.
- Can you describe how the log function works?  
Hint:  $\log x$  is really  $\log_{10} x$  so the answer has something to do with 10.

**Take it further**

- If  $\log 5 + \log 7 = \log p$  can you find the value of  $p$  by experimenting with the log button on your calculator?  
Can you find some other examples like this?  
Can you write this as a general rule?
- Find out how people used log tables and the rule you have just found to do large calculations in the days before calculators and computers.
- Find  $\log 2$  and  $\log 8$ . Find  $\log 5$  and  $\log 25$ . What do you notice?  
Can you find some other examples like this?  
Can you write this as a general rule?
- Find out how you can use this rule to solve equations like  $2^x = 10$  or  $3^x = 72$ , where the power (or index) is unknown.

**Where this goes next**

At A level logarithms are studied in Core Mathematics.