Changing bases

Teacher notes

Why use this resource?

This resource gives students an opportunity to apply their knowledge of the laws of logarithms to change the base of logarithms developing the formula during the *warm-up* exercise. Students are asked to use the graph of $y = \log_5 x$ to plot related functions. They may do this by changing the base or they may notice that they can relate these using graph transformations. There is also a collection of algebraic problems which will help to build up familiarity with relationships between logarithms with different bases. Calculators ideally should not be used.

Preparation

Printouts of the graph for each student will be needed. You may want to print the graph problems and algebra problems as worksheets.

Possible approach

The *warm-up* could be approached as a "show me" exercise, or students could work in pairs to come up with explanations and descriptions and decide which statement is true. The change of base formula can then be brought out during class discussion.

Key questions

For the graph problem

- How are the values of $\log_{25} x$ and $\log_5 x$ connected?
- What transforming effect does that have on the graph?
- How can you use the general formula from the *warm-up* to help?

For the algebra problems

- Can you verify your answers without using a calculator?
- Which can you answer with the basic pattern we discovered in the *warm-up*?
- Which do you need the general change of base formula for?

Possible support

Students might need to be helped to see the connection between the *warm-up* activity and the graph problems. The first or intermediate generalised equations may be most helpful to them.

Possible extension

Students could go on to use these skills in Logarithm lineup as a follow up activity.

For individual extension students might try An irrational inequality.