Disguised Quadratics using Logs

Starter

1. **(Review of last lesson)** Solve: (a) $5^x = 2^{2x+1}$ (b) $8 \times 5^{x-3} = 7 \times 9^x$
   Give your answers exactly (i.e. in terms of logarithms).

2. Solve $5^{2x} - 12(5^x) + 20 = 0$ giving your answers to 3 s.f.
   Hint: Let $u = 5^x$.

Notes

Disguised quadratic questions can involve logarithms as well.

E.g. 1 Solve $3^{2x} - 15(3^x) + 44 = 0$ giving your answers to 3 s.f.

Working:

Let $u = 3^x$ $\Rightarrow$ $u^2 - 15u + 44 = 0$

$(u - 11)(u - 4) = 0$

	$u = 11$	or	$u = 4$
	$3^x = 11$	or	$3^x = 4$
Take logs of both sides:	$\log 3^x = \log 11$	or	$\log 3^x = \log 4$
3rd law:	$x \log 3 = \log 11$	or	$x \log 3 = \log 4$
Exact answers:	$x = \dfrac{\log 11}{\log 3}$	or	$x = \dfrac{\log 4}{\log 3}$
To 3 s.f.:	$x = 1.26$	or	$x = 2.18$

When one of the terms include a power with addition (or subtraction) in it, that term needs to be broken down.

E.g. $5^{x+2} = 5^x \times 5^2 = 25 \times 5^x$

E.g. 2 Solve $3^{2x} + 3^{x+1} - 10 = 0$ giving your answers to 3 s.f.

E.g. 3 Solve $7^{2x} + 12 = 7^{x+1}$ giving your answers to 3 s.f.

Video: Disguised quadratics involving exponentials

Solutions to Starter and E.g.s

Exercise

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