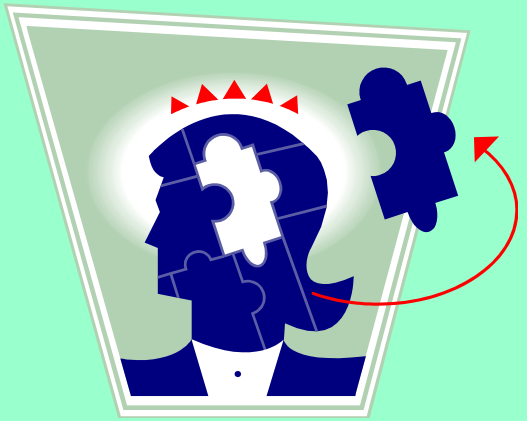
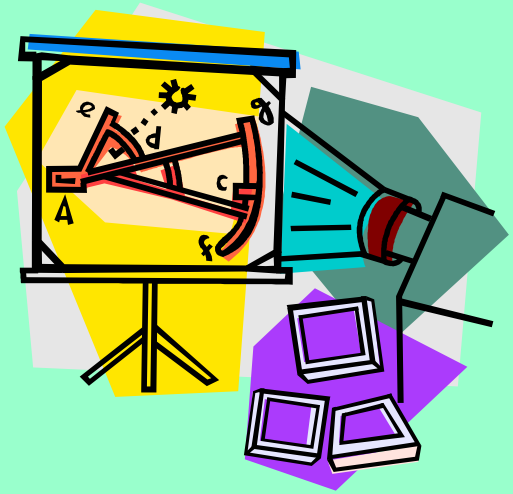


4. Solving equations with logs



Using the laws of logs to solve equations

Example 1

Solve the following, where x is positive:

$(a)\ \log_a 6 + \log_a x = \log_a 18$

$\Rightarrow \log_a (6x) = \log_a 18$

$\Rightarrow 6x = 18$

$\Rightarrow x = 3$

$(b)\ 2\log_a x - \log_a 12 = \log_a 3$

$\Rightarrow \log_a (x^2) - \log_a 12 = \log_a 3$

$\Rightarrow \log_a \left(\frac{x^2}{12}\right) = \log_a 3$

$\Rightarrow \frac{x^2}{12} = 3$

$\Rightarrow x^2 = 36$

x must be positive!

$\Rightarrow x = 6$

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Q1(a), (b), (c), (e), (f), (i)

This is not the end

Using the laws of logs to solve equations

Example 2

Solve the following, where x is positive:

$(a)\ \log_a 14 - \log_a x = \log_a 2$

$\Rightarrow \log_a\left(\frac{14}{x}\right) = \log_a 2$

$\Rightarrow \frac{14}{x} = 2$

$\Rightarrow 14 = 2x$

$\Rightarrow x = 7$

$(b)\ \frac{1}{2}\log_a x + \log_a 6 = \log_a 42$

$\Rightarrow \log_a (x^{\frac{1}{2}}) + \log_a 6 = \log_a 42$

$x^{\frac{1}{2}} = \sqrt{x}$

$\Rightarrow \log_a\left(6\sqrt{x}\right) = \log_a 42$

$\Rightarrow 6\sqrt{x} = 42$

Square both sides → $\Rightarrow \sqrt{x} = 7$

$\Rightarrow x = 49$

Heinemann, p.288, EX 15G,
Q1(d), (g), (h)
Then Q2(f)