



1.  $\log_3 x + \log_3 5 = \log_3 (2x + 3)$

(2)

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2.  $\log_5 5x - \log_5 (x + 2) = \log_5 (x + 6) - \log_5 x$

(4)

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3. Solve the simultaneous equations:

$$\log_x y = 2$$

$$xy = 27$$

(3)

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4. Solve the simultaneous equations:

$$\log_{10} y + 2 \log_{10} x = 3$$

$$\log_2 y - \log_2 x = 3$$

(4)

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### Solutions

1.

$\log_3 5x = \log_3 (2x + 3)$	<b>M1</b>
$5x = 2x + 3$ $x = 1$	<b>M1</b>

2.

$\log_5 \left( \frac{5x}{x+2} \right) = \log_5 \left( \frac{x+6}{x} \right)$ $\frac{5x}{x+2} = \frac{x+6}{x}$	<b>M1</b>
$5x^2 = (x+6)(x+2)$ $5x^2 = x^2 + 8x + 12$ $4x^2 - 8x - 12 = 0$ $x^2 - 2x - 3 = 0$	<b>M1</b>
$(x+1)(x-3) = 0$ $x = -1$ $x = 3$	<b>M1</b>
$\log_5 x$ is not real for $x = -1$ , therefore, $x = 3$	<b>M1</b>

3.

$\log_x y = 2$ $y = x^2$	<b>M1</b>
$x^3 = 27$ $x = 3$	<b>M1</b>
$x = 3, y = 9$	<b>M1</b>

4.

$\log_{10} y + 2 \log_{10} x = 3$ $x^2 y = 10^3$	<b>M1</b>
$\log_2 y - \log_2 x = 3$ $\frac{y}{x} = 2^3$ $y = 8x$	<b>M1</b>
$8x^3 = 1000$ $x^3 = 125$ $x = 5$	<b>M1</b>
$y = 8(5) = 40$	<b>M1</b>

