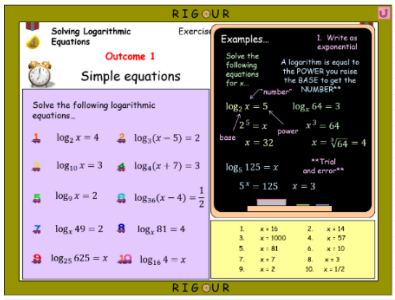
Bronze Outcome 1 – Solving basic equations



① $\log_2 x = 4$
$2^4 = x$
$x = 16$

② $\log_3(x-5) = 2$
$3^2 = x-5$
$x-5 = 9$
$+5 \quad +5$
$x = 14$

③ $\log_{10} x = 3$
$10^3 = x$
$x = 1000$

④ $\log_4(x+7) = 3$
$4^3 = x+7$
$x+7 = 64$
$-7 \quad -7$
$x = 57$

⑤ $\log_9 x = 2$
$9^2 = x$
$x = 81$

⑥ $\log_{36}(x-4) = \frac{1}{2}$
$36^{1/2} = x-4$
$x-4 = 6$
$+4 \quad +4$
$x = 10$

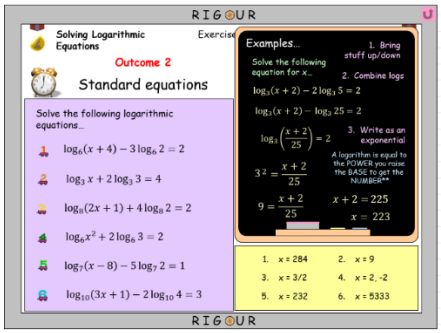
⑦ $\log_x 49 = 2$
$x^2 = 49$
$x = 7$

⑧ $\log_x 81 = 4$
$x^4 = 81$
$x = \sqrt[4]{81}$
$x = 3$

⑨ $\log_{25} 625 = x$
$25^x = 625$
$x = 2$
(since $25^2 = 625$)

⑩ $\log_{16} 4 = x$
$16^x = 4$
$x = \frac{1}{2}$
(since $16^{1/2} = 4$)

Silver Outcome 2 – Solving standard equations



① $\log_6(x+4) - \log_6 8 = 2$
$\log_6\left(\frac{x+4}{8}\right) = 2$
$6^2 = \frac{x+4}{8}$ (4, 36, ×8, 288)
$36 = \frac{x+4}{8}$
$288 = x+4$
$-4 \quad -4$
$x = 284$

② $\log_3 x + \log_3 9 = 4$
$\log_3 9x = 4$
$3^4 = 9x$
$9x = 81$
$\div 9 \quad \div 9$
$x = 9$

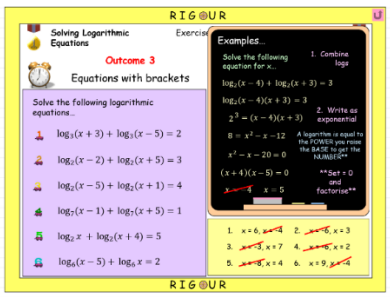
③ $\log_8(2x+1) + \log_8 16 = 2$
$\log_8 16(2x+1) = 2$
$8^2 = 16(2x+1)$
$64 = 16(2x+1)$
$\div 16 \quad \div 16$
$4 = 2x+1$
$-1 \quad -1$
$2x = 3$
$\div 2 \quad \div 2$
$x = \frac{3}{2}$

④ $\log_6 x^2 + \log_6 9 = 2$
$\log_6 9x^2 = 2$
$6^2 = 9x^2$
$9x^2 = 36$
$x^2 = 4 \quad x = 2, -2$

⑤ $\log_7(x-8) - \log_7 32 = 1$
$\log_7\left(\frac{x-8}{32}\right) = 1$
$7^1 = \frac{x-8}{32}$
$x-8 = 224$
$+8 \quad +8$
$x = 232$

⑥ $\log_{10}(3x+1) - \log_{10} 16 = 3$
$\log_{10}\left(\frac{3x+1}{16}\right) = 3$
$10^3 = \frac{3x+1}{16}$
$1000 = \frac{3x+1}{16}$
$16000 = 3x+1$
$-1 \quad -1$
$3x = 15999$
$x = 5333$

Gold Outcome 3 – Equations with brackets



① $\log_3(x+3)(x-5) = 2$
$3^2 = (x+3)(x-5)$
$9 = x^2 - 2x - 15$
$x^2 - 2x - 24 = 0$
$(x-6)(x+4) = 0$
$x = 6 \quad x = -4$

② $\log_2(x-2)(x+5) = 3$
$2^3 = (x-2)(x+5)$
$8 = x^2 + 3x - 10$
$x^2 + 3x - 18 = 0$
$(x+6)(x-3) = 0$
$x = -6 \quad x = 3$

③ $\log_2(x-5)(x+1) = 4$
$2^4 = (x-5)(x+1)$
$16 = x^2 - 4x - 5$
$x^2 - 4x - 21 = 0$
$(x-7)(x+3) = 0$
$x = 7, \quad x = -3$

④ $\log_7(x-1)(x+5) = 1$
$7^1 = x^2 + 4x - 5$
$7 = x^2 + 4x - 5$
$x^2 + 4x - 12 = 0$
$(x+6)(x-2) = 0$
$x = -6 \quad x = 2$

⑤ $\log_2 x(x+4) = 5$
$2^5 = x(x+4)$
$32 = x^2 + 4x$
$x^2 + 4x - 32 = 0$
$(x+8)(x-4) = 0$
$x = -8 \quad x = 4$

⑥ $\log_6 x(x-5) = 2$
$6^2 = x(x-5)$
$36 = x^2 - 5x$
$x^2 - 5x - 36 = 0$
$(x-9)(x+4) = 0$
$x = 9 \quad x = -4$