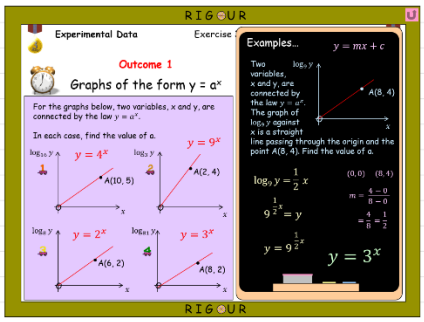
Bronze Outcome 1 – Graphs of the form $y = a^x$



① $\log_{16} y = mx + c$

$m = \frac{5-0}{10-0} = \frac{5}{10} = \frac{1}{2}$ $c = 0$

$\log_{16} y = \frac{1}{2}x$ (write as exponential)

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

$y = 4^x$

② $\log_3 y = mx + c$

$m = \frac{4-0}{2-0} = \frac{4}{2} = 2$ $c = 0$

$\log_3 y = 2x$ (write as exp)

$3^{2x} = y$ (since $3^2 = 9$)

$y = 9^x$

③ $\log_8 y = mx + c$

$m = \frac{2-0}{6-0} = \frac{2}{6} = \frac{1}{3}$ $c = 0$

$\log_8 y = \frac{1}{3}x$ (write as exp)

$8^{\frac{1}{3}x} = y$ (since $8^{1/3} = \sqrt[3]{8} = 2$)

$y = 2^x$

④ $\log_{81} y = mx + c$

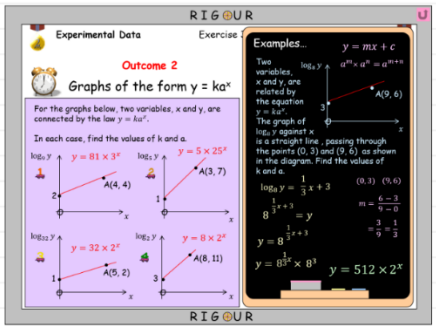
$m = \frac{2-0}{8-0} = \frac{2}{8} = \frac{1}{4}$ $c = 0$

$\log_{81} y = \frac{1}{4}x$

$81^{\frac{1}{4}x} = y$ (write as exp)

$y = 3^x$ (since $81^{1/4} = \sqrt[4]{81} = 3$)

Silver Outcome 2 – Graphs of the form $y = ka^x$



① $\log_9 y = mx + c$

(0, 2) (4, 4)

$m = \frac{4-2}{4-0} = \frac{2}{4} = \frac{1}{2}$ $c = 2$

$\log_9 y = \frac{1}{2}x + 2$

$9^{\frac{1}{2}x+2} = y$ (write as exponential)

$y = 9^{\frac{1}{2}x+2}$ (split up)

$y = 9^{\frac{1}{2}x} \times 9^2$ $y = 81 \times 3^x$

$9^{\frac{1}{2}x} = 3^x$ $9^2 = 81$

③ $\log_5 y = mx + c$

(0, 1) (3, 7)

$m = \frac{7-1}{3-0} = \frac{6}{3} = 2$ $c = 1$

$\log_5 y = 2x + 1$

$5^{2x+1} = y$ (write as exp)

$y = 5^{2x+1}$ (split up)

$y = 5^{2x} \times 5^1$

$5^{2x} = 25^x$ $5^1 = 5$

$y = 5 \times 25^x$

④ $\log_2 y = mx + c$

(0, 3) (8, 11)

$m = \frac{11-3}{8-0} = \frac{8}{8} = 1$ $c = 3$

$\log_2 y = x + 3$

$2^{x+3} = y$ (write as exp)

$y = 2^{x+3}$ (split up)

$y = 2^x \times 2^3$ $2^3 = 8$

$y = 8 \times 2^x$

③ $\log_{32} y = mx + c$

(0, 1) (5, 2)

$m = \frac{2-1}{5-0} = \frac{1}{5}$ $c = 1$

$\log_{32} y = \frac{1}{5}x + 1$

$32^{\frac{1}{5}x+1} = y$ (write as exp)

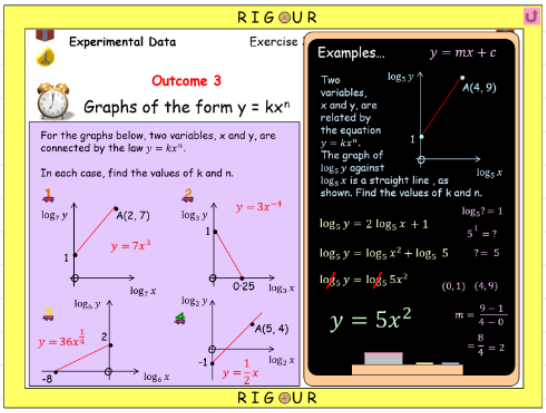
$y = 32^{\frac{1}{5}x+1}$ (split up)

$y = 32^{\frac{1}{5}x} \times 32^1$

$32^{\frac{1}{5}x} = 2^x$ $32^1 = 32$

$y = 32 \times 2^x$

Gold Outcome 3 – Graphs of the form $y = kx^n$



① $\log_7 y = m\log_7 x + c$

(0,1) (7,7)

$m = \frac{7-1}{7-0} = \frac{6}{6} = 1$ $c = 1$

$\log_7 y = 1\log_7 x + 1$ (since $\log_7 7 = 1$)

$\log_7 y = \log_7 x + \log_7 7$

$\log_7 y = \log_7 7x$

$y = 7x$

② $\log_3 y = m\log_3 x + c$

(0,1) (0·25, 0)

$m = \frac{0-1}{\frac{1}{4}-0} = \frac{-1}{\frac{1}{4}} = -4$ $c = 1$

$\log_3 y = -4\log_3 x + 1$ (since $\log_3 3 = 1$)

$\log_3 y = \log_3 x^{-4} + \log_3 3$

$\log_3 y = \log_3 3x^{-4}$

$y = 3x^{-4}$

③ $\log_6 y = m\log_6 x + c$

(−8, 0) (0, 2)

$m = \frac{2-0}{0+8} = \frac{2}{8} = \frac{1}{4}$ $c = 2$

$\log_6 y = \frac{1}{4}\log_6 x + 2$ (since $\log_6 36 = 2$)

$\log_6 y = \log_6 x^{1/4} + \log_6 36$

$\log_6 y = \log_6 36x^{1/4}$

$y = 36x^{1/4}$

④ $\log_2 y = m\log_2 x + c$

(0, −1) (8, 4)

$m = \frac{4+1}{8-0} = \frac{5}{8} = 1$ $c = -1$

$\log_2 y = \log_2 x - 1$

$\log_2 y = \log_2 x + \log_2 \frac{1}{2}$

$\log_2 y = \log_2 \frac{1}{2}x$ (since $\log_2 \frac{1}{2} = -1$)

$y = \frac{1}{2}x$