SATPREP
Assignment: Exponent and Logarithm

1. Solve $\log_2 x + \log_2(x - 2) = 3$, for $x > 2$.

2. Solve the equation $9^{x-1} = \left(\dfrac{1}{3}\right)^{2x}$.

3. Let $f(x) = \log_3 \sqrt{x}$, for $x > 0$.

   (a) Show that $f^{-1}(x) = 3^{2x}$.

   (b) Write down the range of f^{-1}.

   Let $g(x) = \log_3 x$, for $x > 0$.

   (c) Find the value of $(f^{-1} \circ g)(2)$, giving your answer as an integer.

4. Let $f(x) = k \log_2 x$.

   (a) Given that $f^{-1}(1) = 8$, find the value of k.

   (b) Find $f^{-1}\left(\dfrac{2}{3}\right)$.

5. Let $\ln a = p$, $\ln b = q$. Write the following expressions in terms of p and q.

   (a) $\ln a^3 b$

   (b) $\ln\left(\dfrac{\sqrt{a}}{b}\right)$

6. Let $p = \log_{10} x$, $q = \log_{10} y$ and $r = \log_{10} z$.

   Write the expression $\log_{10}\left(\dfrac{x}{y^2 \sqrt{z}}\right)$ in terms of p, q and r.

7. Solve the equation $\log_{27} x = 1 - \log_{27}(x - 0.4)$.

8. Find the **exact** solution of the equation $9^{2x} = 27^{(1-x)}$.

9. (a) Given that $\log_3 x - \log_3(x - 5) = \log_3 A$, express A in terms of x.

   (b) Hence or otherwise, solve the equation $\log_3 x - \log_3(x - 5) = 1$.